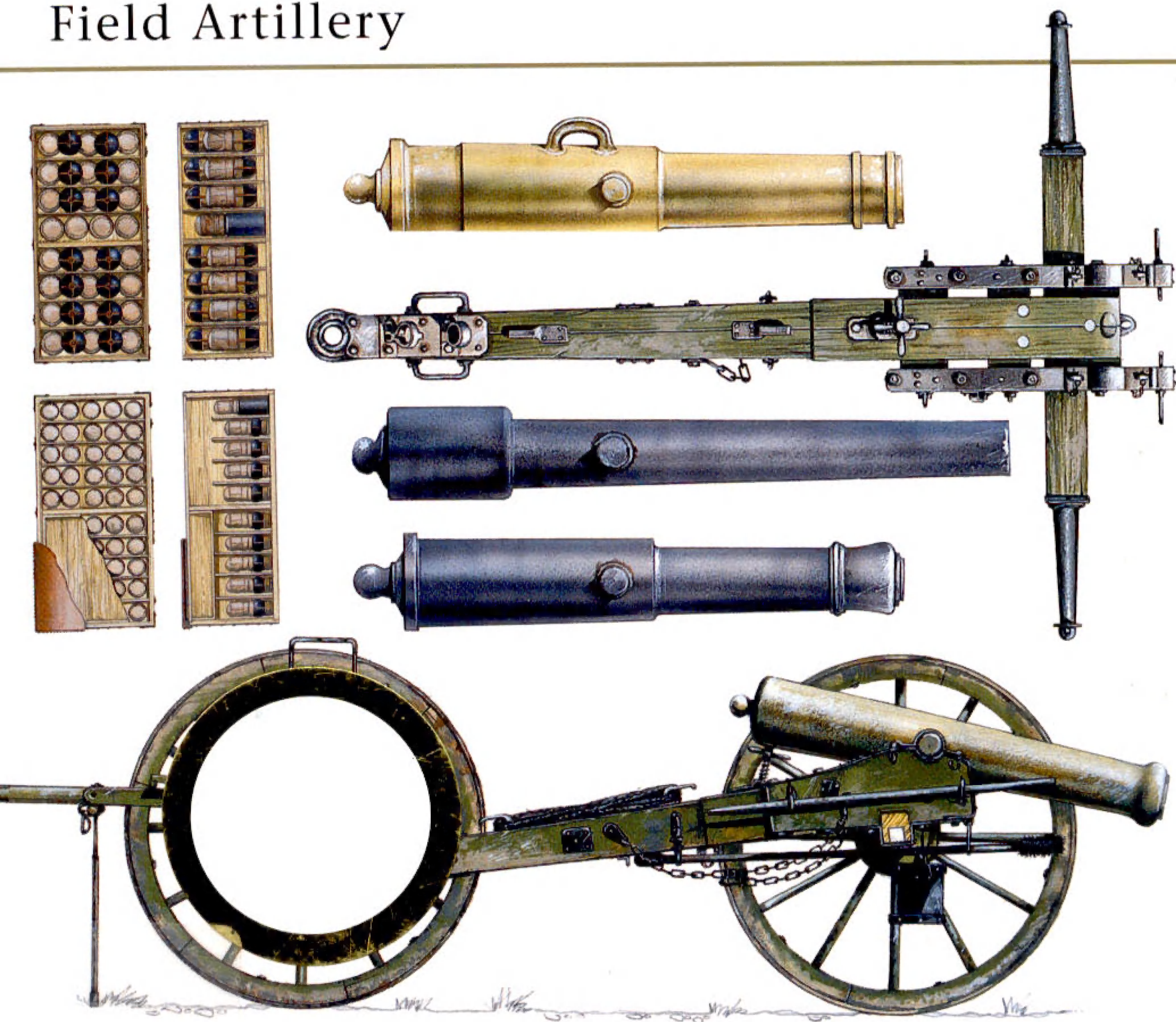


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American Civil War Artillery 1861–65 (1)

Field Artillery



Philip Katcher • Illustrated by Tony Bryan



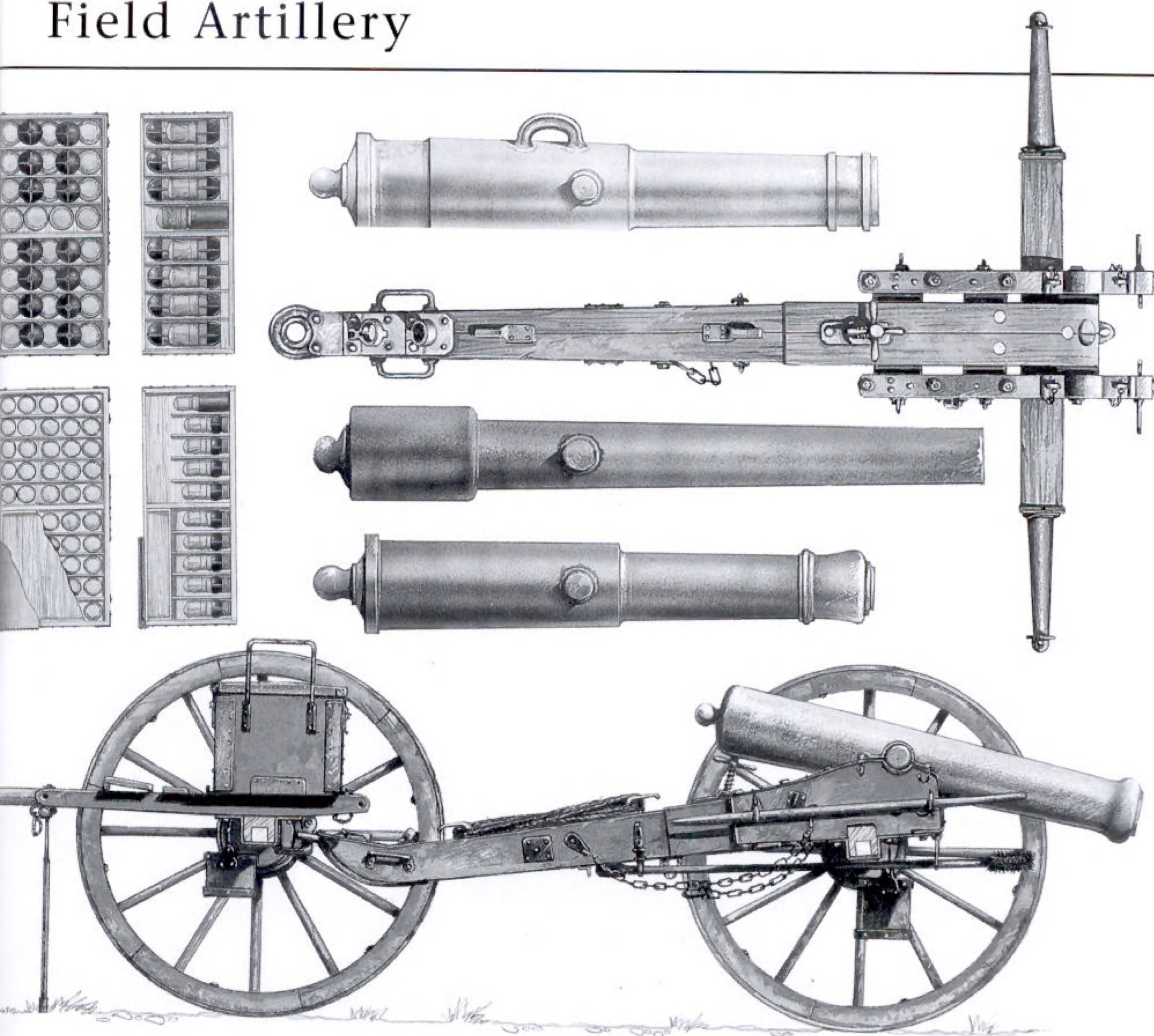
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collection.

**TITLE PAGE A 3-in. Ordnance Rifle on display at the
Gettysburg National Battlefield Park.**

AMERICAN CIVIL WAR ARTILLERY

1861-1865 (1) FIELD ARTILLERY

INTRODUCTION

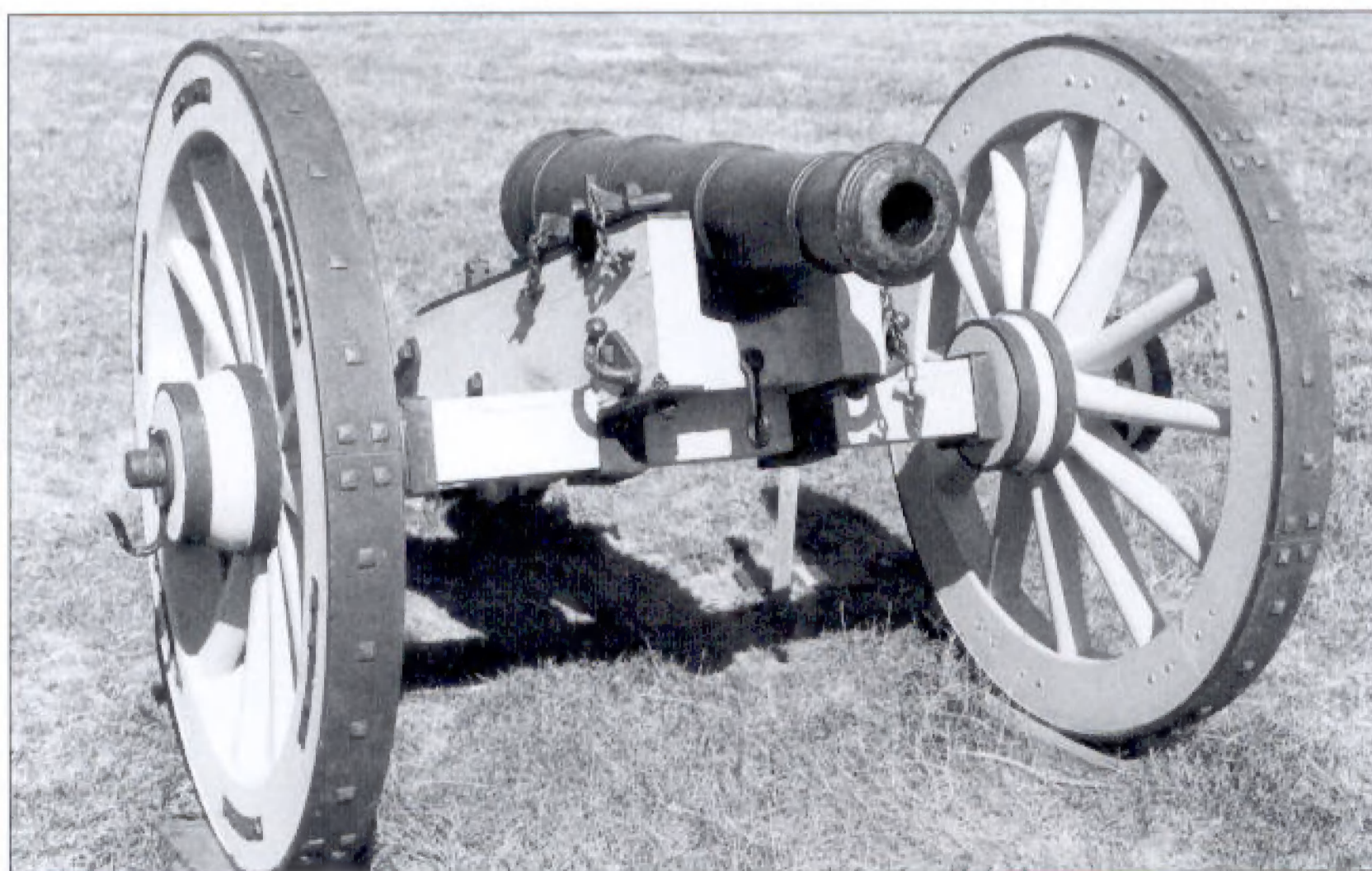
In the 1860s, at the start of the American Civil War, American artillery experts were in the midst of a major change of direction. In the early years of the 19th century, American artillery had an overwhelmingly English influence, which stemmed from the War of Independence nearly a century earlier. At that time, the British army used 3-, 6-, 12-, and 24-pdr. light brass guns, carried on wooden carriages with split trails. During the War of Independence, the Continental Army received some French-made field artillery, 4-, 8-, and 12-pdrs. mounted on carriages that were very similar to those of the British. They also used Swedish-made 4-pdrs. that were utilized by the French Army as regimental close support weapons.

Although these weapons used brass tubes, the copper needed for manufacturing brass was scarce in America, while iron was plentiful throughout the country. Cannon foundries were located in both the north and south of the country before the Civil War, and after 1800 the American army almost exclusively adopted iron for making gun barrels. The exception was the American-designed "King Howitzer," which used a short brass tube with a 2 3/4-in. bore designed to shoot a grenade a short distance, a typical use for a howitzer. It was ideal for fighting Indians in the densely wooded northeast, but was of little use against organized forces using their own artillery.

After the adoption of iron, American-made artillery used the British caliber system of 6-, 12-, 18-, and 24-pdrs. instead of the French system.

On the other hand, French carriage design was chosen over the British style. A series of M1818 "walking stick" cannon burst during tests in 1827, however, and a number of artillerymen began to lose trust in iron. The known brittle qualities of the metal, coupled with its weight, made it unsuitable for cannon tubes, they felt. In 1836, therefore, the Ordnance Board, after testing iron and bronze as barrel metals, decided that America's field pieces

Many batteries at the war's outset were armed with obsolete 6-pdr. cannon with iron tubes, such as this M1831 example. (Ft. McHenry National Park)



should thereafter employ bronze barrels. This ruling did not settle the question immediately, and both metals were used until a commission of ordnance officers toured European foundries, arsenals, and armories in 1840. On their return to the U.S. they reported, and the Ordnance Board confirmed, that bronze was the superior metal and would thereafter be the sole field artillery barrel metal.

In 1840 the U.S. Army adopted a French carriage, copied from a British design, that used a single rather than a split trail. The most common was the 6-pdr. gun carriage, used to mount the standard 6-pdr. iron gun and the 12-pdr. bronze howitzer. Eventually, this would become the standard carriage of the American Civil War for all field artillery (carriages for Napoleons had slightly separated cheeks to accommodate the greater tube diameter). At the same time a new limber and ammunition chest was adopted, the latter with iron handles so that cannoneers could ride on it while it was being transported. The limber was also used to pull newly adopted battery wagons and traveling forges.

The principle gun immediately before the Civil War was the 6-pounder which had been used to great effect during the Mexican-American War (1846-48) by mounted batteries in particular. Mexican artillery, which ranged from 4- to 16-pdrs. with mostly 8-pdrs. in the field, was not as mobile and therefore offered little in the way of effective counter battery fire against highly mobile 6-pdr. batteries. Moreover, Mexican artillery was poorly coordinated and fired mostly solid copper shot that was so slow in flight that the Americans were able to duck easily.

The war reinforced American belief in mobile field artillery, which meant at that point the 6-pounder. But the 6-pdr. had some real problems. The longest range at 5 degrees was 1,523 yards with solid shot, and 1,200 yards with spherical case. Artillerymen wanted a gun that fired heavier shot a greater distance. The 12-pdr. howitzer had the projectile weight, but not the range, since it was basically designed for close-quarter fighting. Moreover, it was relatively heavy, as it was not intended to be a mobile piece but to be used in and around fortifications.

Much the same debate had been going on in France, resulting in a field artillery piece firing a 12 lb. shot, but with a bronze tube weighing only 1,200 pounds. A shorter weapon than the M1841 American model, it was an excellent field piece. The Ordnance Board quickly adopted a copy of this weapon, the Model 1857, as its standard weapon. It was officially known as the "Gun-Howitzer," the "Light 12-pounder," and the "12-pdr. Gun, Model 1857,"

The muzzle of a Napoleon made by the Columbus, Georgia, Arsenal bearing, clockwise from left, the inspector's initials, "C.S ARSENAL COLUMBUS GEO. 1864," and the weight of the tube. (Gettysburg National Battlefield Park)



but it was most commonly called the "Napoleon." Like a howitzer, it was able to fire shells or canister, although technically it was not a true howitzer because it could also fire shot like a gun.

The Napoleon was adopted in 1857 but few were in use in the south before war shut down the borders. The Confederate arsenals and the local forts they captured were stocked mainly with 6-pdrs., and these made up their main field artillery power at first. The handful of guns available from the pre war military forces, (both the regular U.S. Army and some artillery militia groups) was so small that both sides would have to depend on their industries to supply the large volunteer armies needed to fight this war.

Moreover, the southern foundries had been making 6-pdrs. before the war and had the technology and expertise to continue, which was vital in getting a force armed quickly. With the expense of acquiring artillery overseas and the uncertainty of acquiring extra cannon on the battlefield, southern foundries, especially during the war's first years, would bear the brunt of supplying Confederate troops in the field.

At the same time, the U.S. Army started acquiring rifled field pieces, which fired projectiles almost the same weight as the Napoleon, but with much more accuracy than the smoothbore tubes used until then. Given the might of the relatively industrialized north, the Union Army could be relatively quickly supplied with the latest in Napoleons and iron rifled guns, including the 3-in. Ordnance Rifle and 10-pdr. Parrott gun. Except in fringe areas, such as the far western campaigns in places like New Mexico, the 6-pdr. gun was never a front-line gun in the Union forces.

The result, at the battle of Shiloh for example, was that 80 percent of the Confederate artillery was made up of 6-pdr. and 12-pdr. howitzers, while almost half the opposing artillery was modern, rifled 3-in. and 10-pdr. weapons. The 6-pdrs. were vastly outclassed: "Six-pdr. guns

cannot maintain a fight with long range guns," one Confederate artilleryman wrote after the battle of Murfreesboro. At Chickamauga, the Confederate ordnance chief reported all his 6-pdrs. had been "repulsed by 12-pounder light guns." At Antietam in September, 1862, although desperately short of guns to stop Union attacks, 6-pdr. batteries such as Huckstep's 1st Fluvanna Artillery were sent to quiet places in the rear to guard fords rather than face sure defeat in fights against Union artillery.

In March, 1862, the commander of the Confederate Army of Tennessee

A U.S. Army gun crew stands in the position of "action front" with a 12-pdr. Napoleon in a fort near Atlanta, Georgia, in 1864. From this position they could either begin firing or hitch up the cannon for movement.
(Library of Congress)



ordered that all the 6-pdrs. in this force be sent back to foundries and recast as light 12-pounders. Army of Northern Virginia commander Robert E. Lee recommended that all his army's 6-pdrs. be melted down and made into 12-pdrs. in December, 1862. In July, 1862, the Confederate Ordnance Department ordered the main southern gun foundry, Tredegar Iron Works in Richmond, to cease production of 6-pdrs. and start making nothing but 12-pdr. Napoleons. By mid-1863 the 6-pdr. was effectively out of service in the main theaters of action, beginning with the Army of Northern Virginia and spreading thereafter to other forces in the field.

ORGANIZATION OF THE U.S. ARMY FIELD ARTILLERY

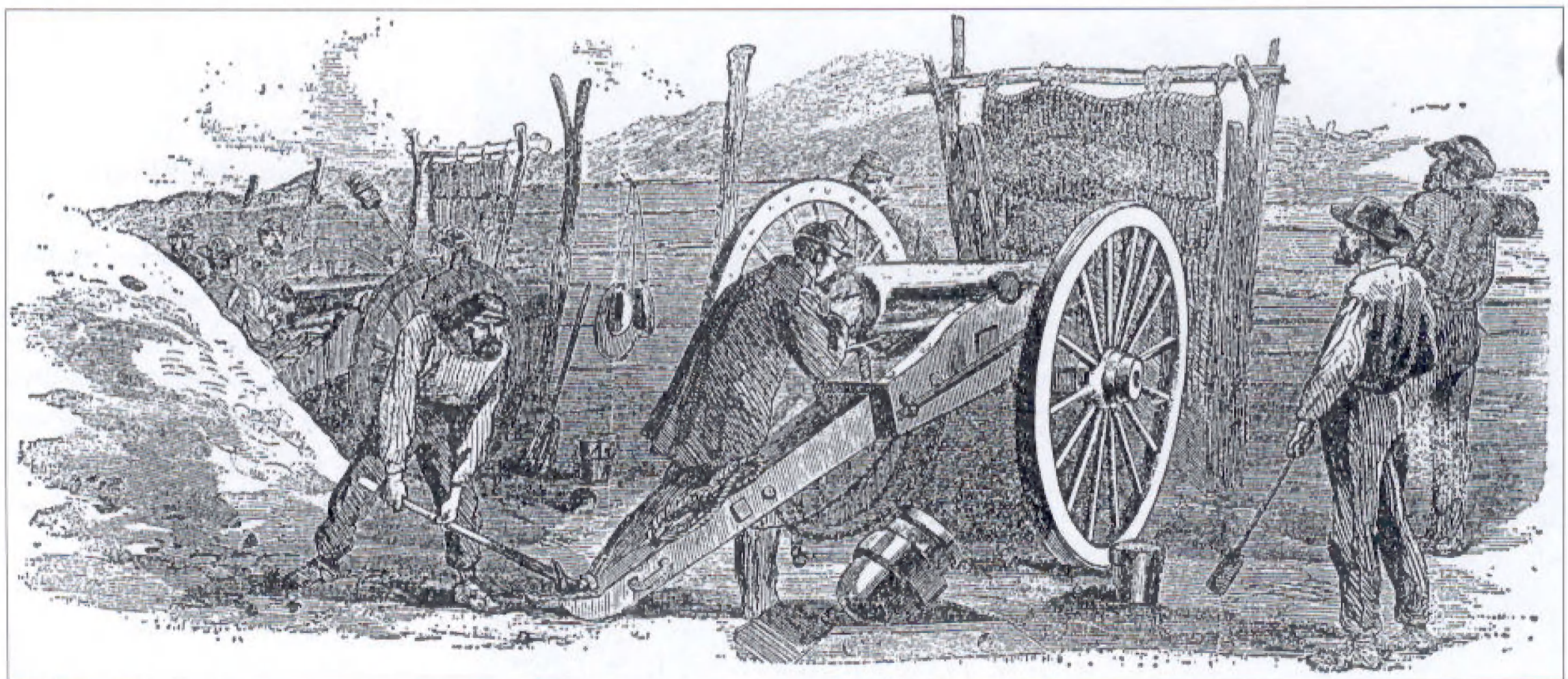
At the start of the war it was felt that the effort to put down the rebellion would be a short one, requiring only three months' worth of service. Since training skilled artillerymen would take longer than that, initially only Regular Army artillery was to be recruited.

"The artillery of the U.S. Army is by far its worst or most slipshod organization of any branch of the service," wrote professional artilleryman Maj. Thomas Osborn in 1864. "This arm has in the regular army always been considered the aristocratic one and sought for assignments by the old officers, yet from the beginning of the war it has been permitted to remain without an organization of its own, except such as it has received as a result of incessant begging and intercession by its officers for a recognized position."

Organization in the Army of the Potomac

At first U.S. batteries were assigned one to each infantry brigade. But fairly quickly after hostilities started some far-sighted artillerymen saw that massed guns were important for battlefield success, and this required organization beyond a battery level. After Bull Run, William F. Barry, who started the war as a captain in the 2d U.S. Artillery Regiment

Once war became static in the trenches around Petersburg in 1864, even field artillery was heavily dug in. This weapon is being aimed by a gunner, while No. three stands ready at the trail to move it as indicated. Note the woven rope shield hanging in front of the gun.



and was one of the board of three who produced the standard manual for U.S. artillery during the war, suggested to George B. McClellan, the commander of the Army of the Potomac, that there were basic principles in successful artillery organization. Among these were:

“1. There should be at least two and one-half and preferably three pieces for every 1,000 men.

2. Materiel should be restricted to the system of the U.S. Ordnance Department [3-in. rifles], of Parrott’s, and of smoothbores, the latter to be exclusively the 12-pounder, model 1857, variously called the ‘gun-howitzer,’ the ‘light 12-pounder,’ or the ‘Napoleon.’ A limited number of smoothbore howitzers would be authorized for special service.

3. Each field battery should, if practicable, be composed of six guns, never less than four, all to be of uniform caliber.

4. Field batteries would be assigned to divisions in lieu of brigades – four per division. One of the four batteries was to be a battery of Regulars, whose captain would also be the division chief-of-artillery. If divisions were combined into corps, at least one-half the division artillery was to constitute the reserve artillery of the corps.

5. There would be an artillery reserve for the whole army of 100 guns. This reserve would contain light field batteries, all guns of position, and all horse artillery until such time as the cavalry units were organized into major-size units.

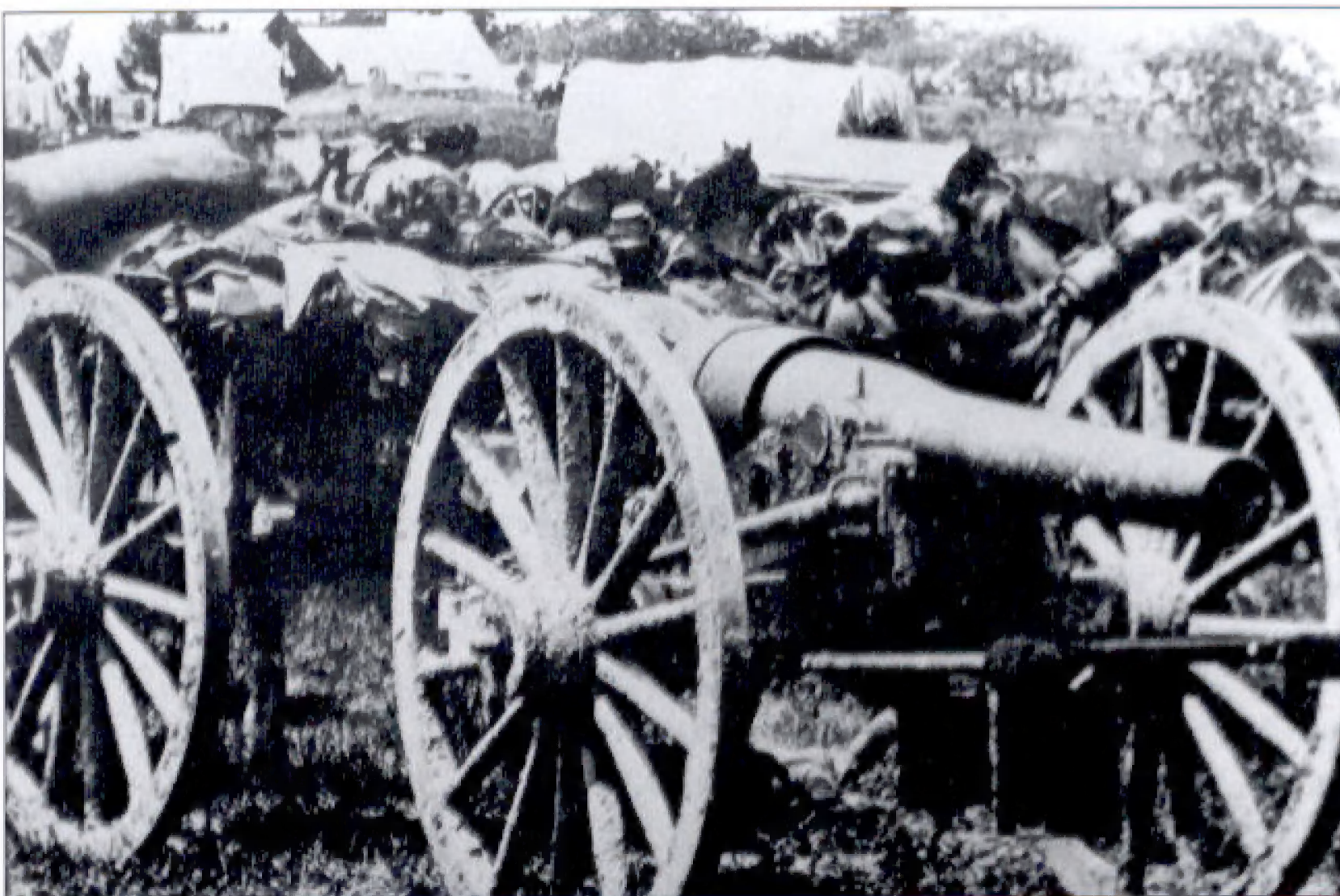
6. The amount of ammunition to accompany the field batteries would not be less than 400 rounds per gun.”

McClellan adopted these ideas, organizing his artillery quite some time before the Confederates. Indeed, this organization served the Army of the Potomac until May 16, 1864, when the high command of the army ordered that each six-gun battery was to be reduced to two sections of four guns, spare guns going back to Washington, and the Artillery Reserve being officially disbanded. Its batteries were reassigned to the brigade of the three infantry corps then serving in the army.

This resulted in an artillery force of some 12 batteries of 48 guns with each brigade.

In March, 1865, the Army of the Potomac’s artillery was again reorganized, with only six batteries being assigned to the II and VI Corps, and five batteries each to the V and IX Corps. All other batteries were reassigned to a renewed Artillery Reserve, grouped around the heavy siege guns and mortars that had joined the army for the siege of Petersburg.

A well used 20-pdr. Parrott rifle, manned by the 1st New York Battery near Richmond in June, 1862. (Library of Congress)



Organization of the Western Armies

The Army of the Cumberland arranged its artillery with three or four batteries being assigned to each division, under a chief of artillery who was usually a captain. The army itself was divided, at the battle of Stone's River, into a right wing, center, and left wing, each with a chief of artillery who was a captain. One battery, the Chicago Board of Trade battery, was posted with the Pioneer Brigade, while another was assigned to the cavalry division.

In September, 1864, Maj. Thomas Osborn, newly assigned army chief of artillery of the Army of the Tennessee, found this type of arrangement, which was used in his new command, lacking: "Since I came to this army I have made a complete reevaluation in the artillery organization of this Army and Department," he wrote. "I found its organization bad, or more exactly I found it without organization. What I have done has been against the wishes of the division and corps commanders. The several batteries were attached to the division, two or three to each division. A division chief of artillery was attached to the staff of the division commander. The returns and reports of the several batteries were generally made to the adjutant general of the division and were returned to the corps and army headquarters as part of the division returns. The chief of artillery of the division seldom took further interest in the batteries than to keep a personal watch over them. He maintained no independent office. Naturally the division commanders desired to retain the command and control of these batteries and from long usage the corps commanders rather favored this plan. I determined to make the change and brigade the artillery of each corps of this army, as it was in the Army of the Potomac and as had been brought to the Army of the Cumberland by the XI and XII Corps and as now exists in the XX Corps composed of the consolidated XI and XII Corps." Osborn got his way.

The Army of the Ohio, too, used batteries assigned to brigades until Maj. Gen. George Thomas assumed command in October, 1863. Thomas assigned 18 batteries to the army's divisions, while another dozen batteries went into a general army reserve. The six Regular Army batteries with that army were posted to the reserve.

Battery A, 2d U.S. Artillery, taken in 1862 near Fair Oaks, Virginia, was armed with 3-in. Ordnance Rifles. (Library of Congress)



ORGANIZATION OF CONFEDERATE FIELD ARTILLERY

On November 1, 1862, the Confederate Adjutant and Inspector General's Office issued its General Orders, No. 81, which spelled out the organization of the light artillery:

"II. The following will be the organization of a company of light artillery, according to the number of guns composing the battery, viz.:

For a battery of six guns: one captain, 2 first lieutenants, 2 second lieutenants, 1 sergeant-major or first sergeant, 1 quartermaster-sergeant, 6 sergeants, 12 corporals, 2 buglers or trumpeters, 1 guidon, 2 artificers, 64 to 125 privates.

For a battery of four guns: one captain, 1 first lieutenant, 2 second lieutenants, 1 sergeant-major or first sergeant, 1 quartermaster-sergeant, 4 sergeants, 8 corporals, 2 buglers, 1 guidon, 2 artificers, 64 to 125 privates."

These batteries were to be the basic artillery organization; banding them together to form regiments or battalions was not considered, although field-grade artillery officers were authorized.

Eye-witness Edwin Forbes drew this battery of 3-in. Ordnance Rifles being taken into action.



The Army of Northern Virginia

On May 7, 1861, Virginia authorized its inspector-general to raise six batteries of four guns each for its forces. This made up the nucleus of what would become the field artillery of the Army of Northern Virginia. Following standard prewar practice, each battery was assigned under the command of an infantry brigade commander. Some leading officers

pressed for the formation of battalions as early as the winter of 1861/62, but this proposal was shelved for the time being. Confederate artillery officer E. Porter Alexander, writing of the Peninsular Campaign of 1862, said: "Our artillery, too, was even in worse need of reorganization. A battery was attached, or supposed to be, to every brigade of infantry. Beside these, a few batteries were held in reserve under old [Brigadier] Gen. [William] Pendleton [the army's chief of artillery]. Naturally our guns and ammunition were far inferior to the enemy's, & this scattering of the commands made it impossible ever to mass our guns in effective numbers. For artillery loses its effect if scattered."

Finally, in January, 1862, Pendleton "respectfully proposed that in each corps the artillery be arranged into battalions, to consist for the most part of four batteries each, a particular battalion ordinarily to attend to a certain division, and to report to, and receive orders from, its commander, though liable to be divided, detached, etc., as the commanding general or corps commanders may seem best, past associations to be so consulted in the constitution of these batteries as that each shall, as far as practicable, contain batteries that have served together, and with the divisions which the battalion is still ordinarily to attend. These battalions ought to have, it is believed, two field officers each, a surgeon, an ordnance officer, and a bonded officer for supplies, if not both quartermaster and commissary."

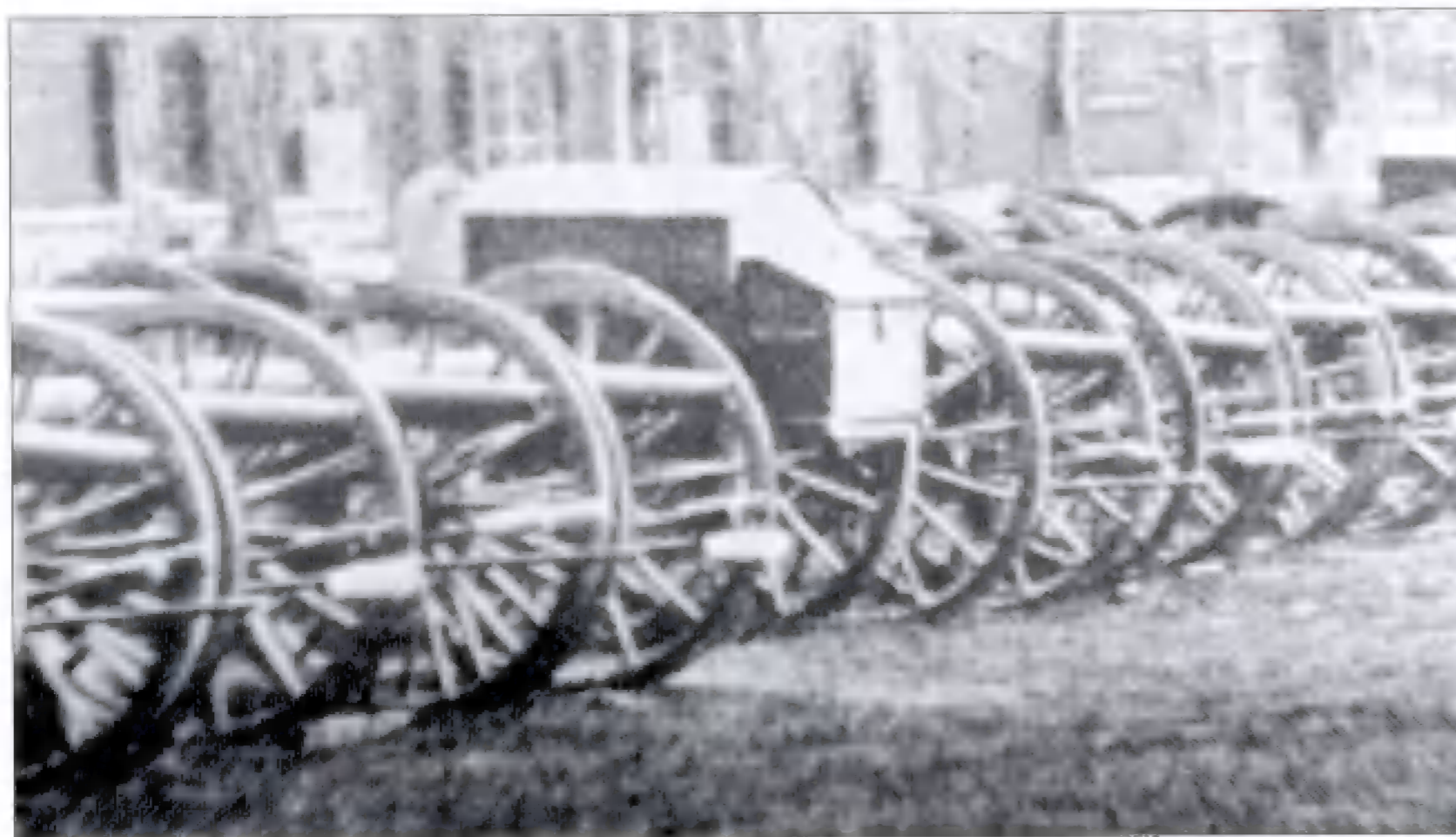
This suggestion was accepted and by the start of the Chancellorsville campaign artillery battalions were generally accepted as commands independent from the infantry. A visiting Austrian officer, FitzGerald Ross, later described the organization as he viewed it in the spring of 1863: "The artillery is organized into battalions; five battalions in a corps of three divisions, one to each division, and two in reserve. They always mass the artillery now, and commanders of battalions say that they loose no more men in a battalion then they formerly did in a single battery. Each battalion is complete in itself, with quartermaster, adjutant, ordnance officer, surgeon, &c. The whole is under the control of the chief of artillery of the army, but assigned at convenience to the corps commanders, one of whose staff-officers is chief of artillery to the corps, and another chief of ordnance."

The Army of Tennessee

In 1861 the State of Tennessee adopted the standard U.S. Army field organization for its batteries, meaning each one was to have six guns and from 94 to 155 men, all ranks. This formed the standard for what became the Army of Tennessee, one of the two main field armies of the



Soldiers learned after a couple of years of war to dig in whenever they halted for any time at all. The men of Stevens' Battery at Cold Harbor are not only dug in, but the cannoneers duck even while going through their gun drill.



A battery, or traveling forge, parked among the guns of a New York battery.
(Library of Congress)

Confederacy. Each battery was assigned to serve an infantry brigade, rather than having the batteries massed into battalions.

In March, 1862, Gen. P. G. T. Beauregard, commanding the Army of Tennessee, ordered the corps of Lt. Gen. Leonidas Polk, newly arrived with the rest of the army in Corinth, Mississippi, to standardize its artillery at three guns per 1,000 infantry, with uniform calibers in each

battery, which were to consist of four or six guns each. In May, 1862, following the battle of Shiloh, Beauregard reduced each six-gun battery to four, with excess lieutenants being posted to heavy artillery or held to replace expected casualties.

Finally, in March, 1864, newly arrived Gen. Joseph E. Johnston organized his field artillery batteries into regular battalions, each to consist of three four-gun batteries. A major, assisted by a quartermaster, a commissary, two or three surgeons, and an adjutant, commanded each battalion. Three battalions were held as an army reserve, while each of the other battalions was assigned to a division. The three reserve battalions made up one regiment, while each corps had an artillery regiment made up of the battalions assigned to the divisions within that corps. The first regiment had 12 batteries, 48 guns, 742 horses, and 1,243 men; the second regiment had nine batteries, 36 guns, 582 horses, and 1,078 men; the third regiment had nine batteries, 36 guns, 566 horses, and 1,016 men. The battalion of horse artillery had five batteries, 22 guns, some 335 horses, and 420 men.

On 14 November 1864, Lt. Gen. John B. Hood, who replaced Johnston, (much to the chagrin of the army) reorganized the artillery, reverting to the old division-level assignments with each battalion being assigned to a particular division. This reorganization would prevent the massing of guns on a full regimental level, but in practice most battalion commanders continued to report directly to their divisional commanders, rather than the regimental commanders. It merely confirmed what had already been taking place.

EQUIPMENT

According to the basic Federal artillery manual, each gun crew should have two sponges and rammers, two sponge covers, one worm and staff, two handspikes, one sponge bucket, one prolonge (a long line used to pull a gun to the rear without horses), one tar bucket, two leather water buckets, two gunner's haversacks, two tube pouches, one fuze gouge, one fuze wrench, one vent punch, one gunner's pincers, one tow hook, one pendulum hausse (essentially a gun's detachable rear sight), two

thumbstalls, one priming wire, two lanyards, one gunner's gimlet, and one large tarpaulin. Each caisson should be equipped with a felling ax, a long handled shovel, a pickax, a spare handspike, a spare pole, a spare wheel, a fuze gouge, two tow hooks, a tar bucket, two leather watering buckets, and a large tarpaulin.

Confederates captured two James rifles from the 1st Connecticut Light Battery near Charleston and, as typical of all armies, the commanding officer had to list every item lost to the enemy. His list gives a good idea of the essential equipment each gun crew actually brought to the field: "2 6-Pdr. James Rifles -3.80"; 2 6-Pdr. carriages with limber chests; 4 sponges & rammers; 3 sponge covers; 1 worm & staff; 4 handspikes; 2 vent covers; 2 sponge buckets, tin; 2 prolongs; 2 gunners pincers; 3 tow hooks; 1 thumbstall [one cannoneer obviously escaped]; 2 priming wires; 1 lanyards; 2 gunners gimlets; 2 fuze reamers; 2 fuze shears; 2 tompions; 1 tar bucket, tin; 2 watering buckets, leather; 1 set harness for two lead horses." Listed, but not mentioned in the official list, were the leather vent covers that were strapped around the tube to protect the weapon when not in use it, and a tompion to fit into each bore as further protection.

The same organization further listed equipment that had become unserviceable and its list indicates how long such equipment could be expected to last in the field. An iron tar bucket, a lanyard, and a sponge and rammer lasted 28 months; a sponge cover was worn out in ten months; three rammer heads were worn out in 11 months; while 6 woolen sponges were worn out in four months.

Each field battery was also supplied with a traveling forge, complete with tools and materials required for shoeing horses and doing other necessary repairs, and a battery wagon on which a variety of carpenter's and saddler's tools were stored.

AMMUNITION

"There are four kinds of projectiles used in field service," wrote the authors of the standard U.S. Army artillery field manual, "the solid shot, the canister, the shell, and the case shot.

"The projectile is attached to a block of wood called a sabot. For the guns and the 12-pdr. howitzer, the cartridge and the projectile are attached to the same sabot, making together a round of fixed ammunition ...



A well used battery forge.
(Library of Congress)

"The solid shot is spherical, and its weight in pounds is used to designate the caliber of the gun to which it belongs.

"The canister consists of a tin cylinder, attached to a sabot and filled with cast-iron shot. These shot vary in diameter, and of course in weight, with the caliber and description of the piece. Canisters for guns contain 27 shots each; those for howitzers contain 48 shots each. They are packed in sawdust in four tiers; the lower tier rests on a rolled iron plate, which is placed on the sabot, and the canister is closed with a sheet-iron cover ...

"The shell is a hollow shot, with such thickness of metal as enables it to penetrate earthworks, wooden buildings, &c., without breaking. For service it is charged with powder, and bursts with great force. Firing is communicated to the charge by means of a fuze, inserted in the hole through which the powder is introduced, the time of the explosion being regulated by the preparation of the fuze. The shell is designated by the weight of the solid shot of the same diameter.

"The shrapnel or case shot is a hollow cast-iron shot forming a case which is filled with musket balls. Melted sulphur or resin is poured in to fill up the interstices and secure the balls in their positions. After this is solidified, a portion of the contents is bored out and the vacant cylindrical space filled with powder, the amount of the charge being only sufficient to rupture the case, which has less thickness of metal than the shell, and to disperse the contents. Fire is communicated to the charge by the means employed for exploding the shell."

While both sides used the same types of ammunition, southern-made rounds were noticeably poorer in quality than northern-made ones. E. Porter Alexander, a Confederate artillery battalion commander, commented that in 1861: "Our smooth bore shells & shrapnel would

A Union battery at Fort Sumner on the Chickahominy on June 27, 1862, with its 10-pdr. Parrott rifles. Note the limber chest tucked away below the gun parapets, but close enough to bring ammunition up quickly. (Author's collection)



very frequently explode prematurely, & our rifle shot & shells would all tumble or fail to go point first, so they had no range at all & were worse than worthless ... We gradually made great improvements, but the enemy were always far ahead of us in artillery ammunition of all kinds both in quality & quantity."

A flannel bag containing the powder was inserted separately from each round of ammunition.

AMMUNITION CARRIED IN EACH CHEST

A comparison of the recommended inventory carried in the limber chest as listed in the Confederates States (CS) Ordnance Manual, 1863, and the U.S. Field Artillery Instructions, 1864.

Gun	Item	Number of rounds (U.S.)	Weight in pounds (U.S.)	Number of rounds (CS)	Weight in pounds (CS)
6-lb.	Shot	25	190	25	190
	Spherical case	20	140	20	140
	Canister	5	42	5	42
	Total rounds	50		50	
	Spare 1.4-lb. cartridges	2	2.5	2	2.6
	Primers	75	.6	75	.97
	Yds. slow match	1.5	.4	2	.38
	Port-fires	3	.6	2	.57
	Total Weight		376.1 lb.		376.52 lb.
12-lb.	Shot	20	308	12	184.8
	Spherical case	8	117.6	12	176.4
	Shell	0	0	4	48.68
	Canister	4	67.6	4	67.64
	Total rounds	32		32	
	Spare 2.5-lb. cartridges	2	5	2	5.12
	Primers	48	.4	48	.62
	Yds. slow match	2	.5	1.5	.28
	Port-fires	4	.7	3	.57
	Total Weight		499.8 lb.		484.11 lb.
12-lb. howitzer	Shell	15	157.5	15	157.5
	Spherical case	20	273	20	273
	Canister	4	47.4	4	47.4
	Total rounds	39		39	
	Primers	6	.5	58	47.4
	Yds. slow match	1.5	.4	2	.38
	Port-fires	3	.6	3	.57
Total Weight			479.4 lb.		479.6 lb.

FUSES

The Bormann fuse, a circular metal disk about an inch-and-a-half in diameter and a half-inch thick was most commonly used. It was tapped so it could be screwed into the shell, while the inside was filled with a



circular train of powder. Its face was marked with a set of parallel lines of differing lengths and numbers, each representing a different time. The gunner cut into the fuse at the proper point for the shell to explode at a given time. The first mark exploded the shell at three quarters of a second after firing; the second, one second; the third, a second and a quarter; the fourth, a second and a half; the fifth, a second and three quarters; the sixth, a number 2, at two seconds; and so fourth up to five and a quarter seconds. This proved to be the most reliable fuse in Federal service.

The poor quality of southern-made Bormann fuses caused battery commanders some problems. According to Alexander: "Confederate artillery could only sparingly, & in great emergency, be allowed to fire over the heads of our infantry. We were always liable to premature explosions of shell & shrapnel, & our infantry knew it by sad experience, & I have known of their threatening to fire back at our guns if we opened over their heads. Of course, solid shot could be safely so used, but that is the least effective ammunition, & the infantry would not know the difference & would be demoralized & angry all the same." Indeed, production of southern-made Bormann fuses was discontinued in December, 1862, although some batteries were forced to use them as late as Gettysburg. Instead, the Confederates used a variety of fuses, ranging from simple paper models to an elaborate device that used a bullet attached to a friction primer. As the shell rotated in the barrel, the bullet was spun off, igniting the primer which had been previously picked for the correct time required.

The Federal artillery also experimented with placing a percussion cap on a cone under a metal cover on the nose of ammunition fired with rifled guns. Since the nose of a round fired with a rifled gun would hit the target first, the percussion cap would then fire the shell on impact. This meant that estimating times for setting fuses would be unnecessary. The Confederates used similar fuses made of copper which screwed into the shell nose.

Due to the problems of premature explosions when firing over infantry, J. P. Shenkl produced a 3-in. Ordnance Rifle shell encased in

papier-mâché which would turn into harmless powder as it flew towards its target. Another maker, James, produced ammunition for his system of rifled smoothbores that used a long soft-metal covering that fit into the grooves on firing. The cast-iron body was oblong and had a cast of slanted iron ribs under the tinplate and lead covering. The special ammunition produced by Wiard for his guns used a cast-iron body loaded with shot and bound by wire. The wire was connected to projections at the end. Small holes allowed the gas on discharge to enter the projectile, expanding its sides.

THE M1857 NAPOLEON

The first Napoleon was cast in December, 1856, by the Ames Manufacturing Co., Chicopee, Massachusetts. It was the only exact copy of the French Army's field piece, complete with handles on the top above the trunnions, and a full 61-in. long tube. There was some dissatisfaction with the results obtained with this length barrel, and future tubes were made some three inches longer. The original tube is presently located at the Petersburg (Virginia) National Military Park.

Ames cast four more tubes in 1857, followed by another four in February, 1861. All of these guns were the same as the first, save for the added three inches to the tube. This was the total complement of Napoleons when the Civil War broke out.

They proved highly successful. A Napoleon could fire a 2.5 lb. charge, sending solid shot some 1,680 yards, a range that easily encompassed the major battlefields of the period. Its crews could fire solid shot, spherical case, and shell, not to mention canister, which against personnel at ranges of some 300 yards was amazingly deadly. Moreover, it was a dependable weapon. George D. Ramsay, then a brigadier general and Chief of Ordnance, reported in July, 1864, that: "No instance has occurred during the war ... of the 12-pdr. bronze gun (the Napoleon) having worn out or of its bursting ..."

Although the army had been using a version of the Napoleon for almost four years when the war broke out, its ordnance officials wanted to compare it against the French models. Therefore, in June, 1861, the Secretary of War requested "from France a sample of Napoleon gun, or one of each caliber, both rifled and smooth bored, if there be more than one caliber and kind."

In August, 1861, with the army satisfied that it

This M1857 12-pdr. Napoleon was made by Ames, serial number 78, and dated 1862. (Gettysburg National Battlefield Park)





The markings on the muzzle of the M1857 12-pdr. include, clockwise from left, the weapon number, the weight of the tube, the date of manufacture, and the inspector's initials.

had a good imitation of the French cannon, Ames cast another ten Napoleons. Ames was not capable of producing all the cannon required by the U.S. Army, and contracts were granted that year to Cyrus Alger & Company (the South Boston Iron Works), which had produced cannon for the U.S. Army since 1836. Even this addition was not enough, and contracts were also given to The Revere Copper Co. and Henry N. Hooper & Co., both of Boston for yet more Napoleons. Miles Greenwood & Co., of Cincinnati, Ohio, received contracts for a limited number of Napoleons for the western theater.

These weapons were intended to bear markings as required by an 1840 Ordnance Department regulation:

"All cannon are required to be weighed and to be marked as follows, viz.: the number of the gun, and the initials of the inspector's name, on the face of the muzzle; the number in a separate series for each kind and caliber at each foundry; the initial letters of the name of the founder and of the foundry, on the end of the right trunnion; the year of fabrication on the end of the left trunnion; the foundry number on the end of the right rimbase, above the trunnion; the weight of the piece in pounds on the base of the breech; the letters 'U.S.' on the upper surface of the piece, near the end of the reinforce."

In 1861 orders were sent out for all marks, save the rimbase number and the U.S., to be placed on the muzzle face. All the 1861 Ames guns used the old marking system, but later Ames tubes used the new system. Alger changed to the new system in December, 1861, and the other makers used the new system from the beginning. Napoleons cast after the first 36 weapons had been delivered to the army were simplified by the removal of the handles, or dolphins. These began to see service by late 1861.

At least one variation to the standard bronze U.S. Army Napoleon, made without handles, should be noted. The Phoenix Iron Co., which made 3-in. Ordnance Rifles under U.S. Army contract, made what appears to be a wrought iron copy of a Napoleon, without the characteristic muzzle swell, apparently in 1863. The tube, now in the town square of Jefferson, Pennsylvania, bears markings which are standard on the company's Ordnance Rifles, although the tube weighs around 1,220 lb. rather than the 815 lb. of the Ordnance Rifles. It lacks the required initials of a U.S. Army ordnance officer, suggesting it was made as an experimental piece to test wrought iron as a substitute for bronze.

There was also an experiment to rifle the tubes. Six rifled Napoleons have survived: all are at the Gettysburg National Military Park. These were all made by Ames (numbers 77 to 82) and used a rifling system devised by a Charles T. James, with ten deep, narrow grooves cut into the bores of the tubes, which allowed the weapons to retain the same 4.62-in. bore diameter.

A letter from Ramsay, then a lieutenant-colonel, to Ordnance Department chief Brig. Gen. J. W. Ripley dated August 2, 1862, says that the trials of the three batteries of rifled Napoleons proved satisfactory.

Even so, the existing tubes were never stamped with an ordnance inspector's initials, nor with the "U.S." on their tops. No further James-rifled Napoleons were made. The comparatively soft bronze tubes wore out sooner than iron-rifled tubes, and if smoldering cartridge fragments settled into the grooves and were not put out by sponging, they could provoke premature discharges.

Other than these experimental weapons, Napoleons were produced throughout the war without major variations. Minor variations included two small bronze blocks cast into the tube at its breech. The pendulum hausse bracket was cast at the top of the tube's breech, and these were omitted on Greenwood tubes. The bracket at the bottom was the base plate, designed to provide a flattened surface where the tube rested on the elevating screw bore. Hooper tubes lacked the base plate. All other tubes had both.

As senior Confederate officers had almost universally been U.S. Army officers, it is not surprising that the Southern Army eventually adopted the 12-pdr. Napoleon as its standard field piece. However, the lack of manufacturing ability affected the quality and types of southern-made Napoleons. Moreover, the Confederate Army had many older weapons in its batteries, including quite a number of 6-pdrs., which came from various southern state arsenals, and did not find an immediate need to change to a new weapon.

On December 5, 1862, Robert E. Lee, commanding the Army of Northern Virginia, wrote to the Secretary of War: "I am greatly in need of longer range smooth-bore guns, and propose that, if metal cannot otherwise be procured, a portion, if not all, of our 6-pounder smooth-bores (bronze), and, if necessary, a part of our 12-pounder howitzers, be recast into 12-pounder Napoleons... The contest between our 6-pounder smooth-bores and the 12-pounder Napoleons of the enemy is very unequal, and, in addition, is discouraging to our artillerists."

Change was already underway. On November 13, 1862, the Confederate Chief of Ordnance, Col. Josiah Gorgas, issued a circular stating:

"Until further order, no artillery will be made except the following caliber:

Bronze - Light 12-pounder or Napoleon guns, caliber 4.62.

Iron - For field battery of maneuver, 10-pounder Parrotts, banded, caliber 2.9. For field battery of reserve, 20-pounder Parrotts on 12-pounder carriages, caliber 3.67. For siege guns, 30-pounder Parrotts on 18-pounder siege-carriages, caliber 4.2."

The most important supplier of southern Napoleons was J. R. Anderson & Co., better known as the Tredegar Iron Works, in Richmond, Virginia. It had experience casting cannon dating back to the 1840s, and began casting guns first for southern states and, by summer 1861, for the Confederate government itself. Unfortunately for the production of Napoleons, the south ran into a severe copper



A close-up of the James rifle, showing the novel front sight that was cast as part of the barrel. (Gettysburg Battlefield National Park)



Another view of the most common weapon of the war: the northern-made M1857 Napoleon. (Gettysburg Battlefield National Park)

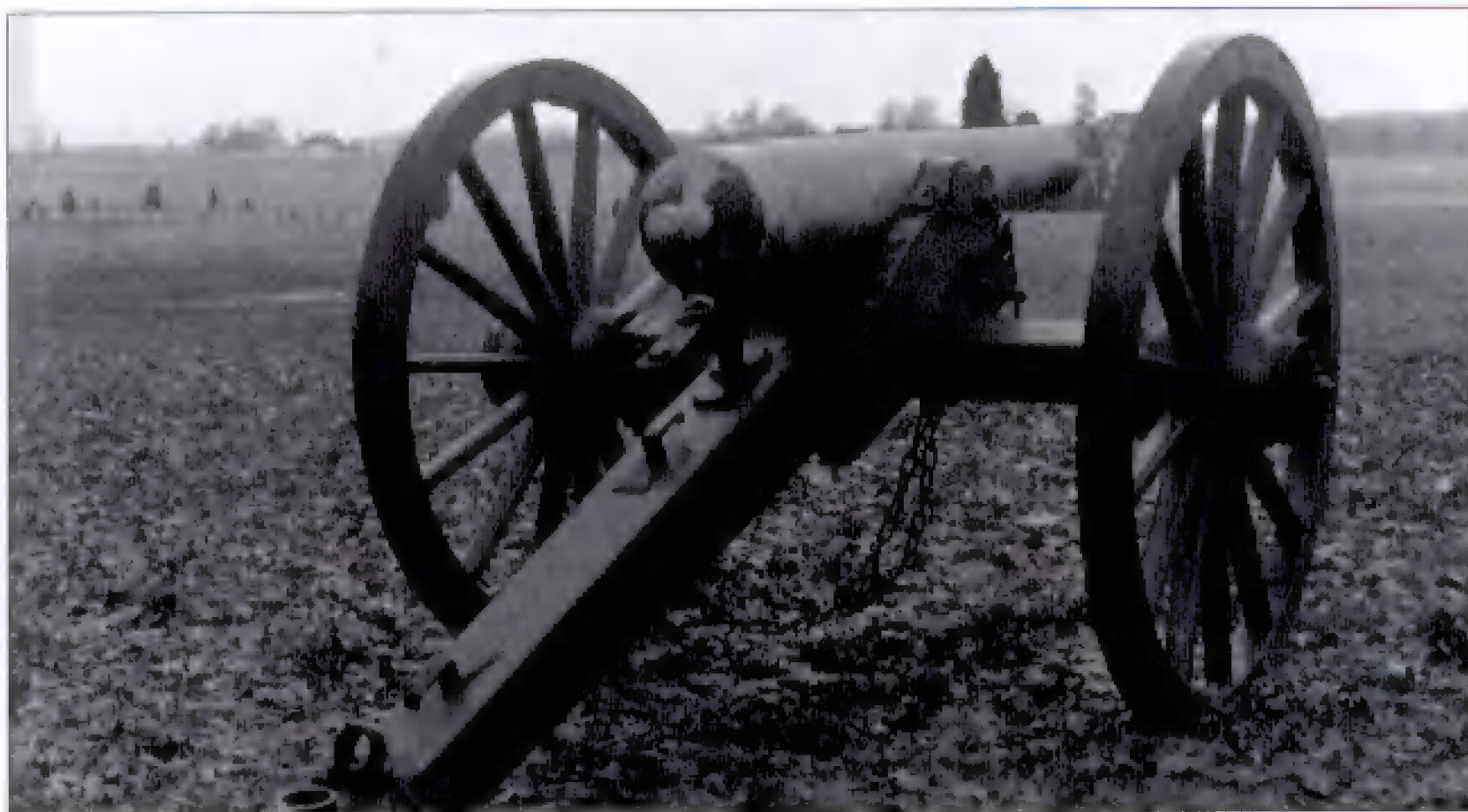
shortage that by May, 1861, halted the manufacture of any bronze guns. By December, when enough copper was found, (much of which came from stills and church bells) bronze casting could resume, but the metal shortage was to plague southern gun founders throughout the war. Although copper was available from time to time, Tredegar found it difficult to get enough of the precious material to produce Napoleons in even the required numbers. By early 1863 Lee had sent his 6-pdr. tubes back to Richmond where they were made into new cannon, so that Tredegar Napoleon production began in earnest in the first half of 1863. Lee received a number just before Chancellorsville, and a second batch somewhat later. By Gettysburg he had received 49 Tredegar Napoleons, and was able to replace all the army's 6-pounders.

By July, 1863, a visiting Austrian Army officer, FitzGerald Ross, was able to record: "The field-piece most generally employed is the smooth-bored 12-pound 'Napoleon' (canon obusier), which fires solid shot, shell, case, and canister: it is much lighter than the ordinary 12-pounder, and they can give it an elevation of nine to ten degrees." Ross went on to say: "In Northern Virginia 12-pound howitzers and 6-pdr. guns are discarded, and Napoleons have been cast from their metal," adding, "for general use, almost all consider the Napoleon most serviceable."

The Tredegar Napoleons were also different from Federal Napoleons in that they lacked the muzzle swell. Some Confederate officers said the Tredegar version jarred less than northern-made weapons, but many others felt that the U.S. Army versions were superior. The majority of Tredegar Napoleons went to the Army of Northern Virginia.

The other major Confederate Army, the Army of Tennessee, originally received its Napoleons from two sources. The first, Leeds & Co., went out of production when their home city of New Orleans was captured in April, 1862; the second, Quinby & Robinson, cast guns until their home city of Memphis fell to the U.S. Navy in June, 1862, and then switched production to Cartersville, Georgia.

A Confederate-made Napoleon 12-pdr. cannon from the Columbus, Georgia, Foundry. (Gettysburg Battlefield National Park)



In March, 1863, much the same as in the east, Army of Tennessee commander Gen. Braxton Bragg ordered that his army's 6-pdrs. gradually be phased out, and recast into Napoleons. Most of this work was done in three arsenals. The Augusta Arsenal, Augusta, Georgia, cast Napoleons that differed from other southern weapons in that the junction of the barrel and breech was rounded and not sharp.

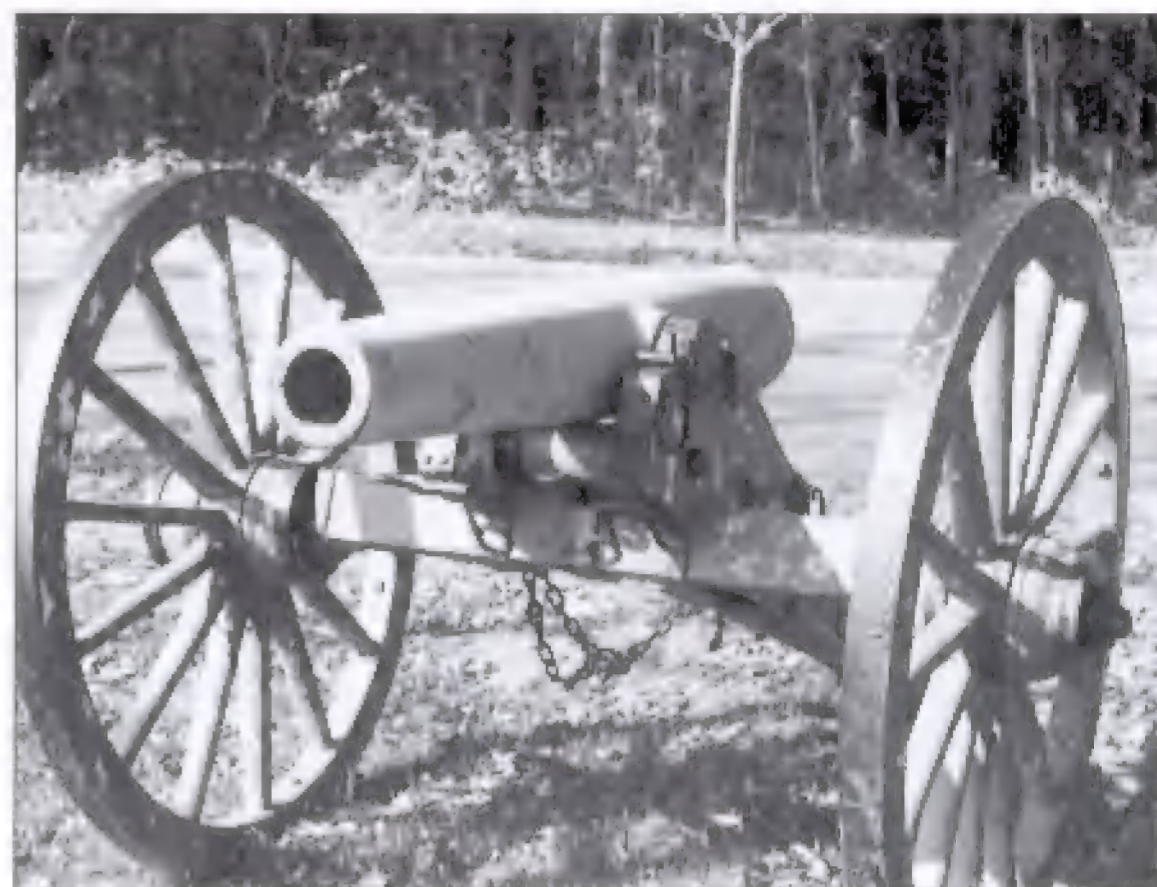
These guns were first produced in late 1862. The Augusta guns were made of a metal developed by Austrian gunsmiths which included copper, tin, wrought iron, and zinc. Each weapon was tested by loading with a charge of powder, followed by bolts rammed in clear to the muzzle.

The remaining two arsenals were the Columbus, Georgia, which was formed with equipment taken from the Baton Rouge (Louisiana) Arsenal, and began producing Napoleons in mid-1863 and the Macon, Georgia, Arsenal, which produced its first Napoleons in early 1863.

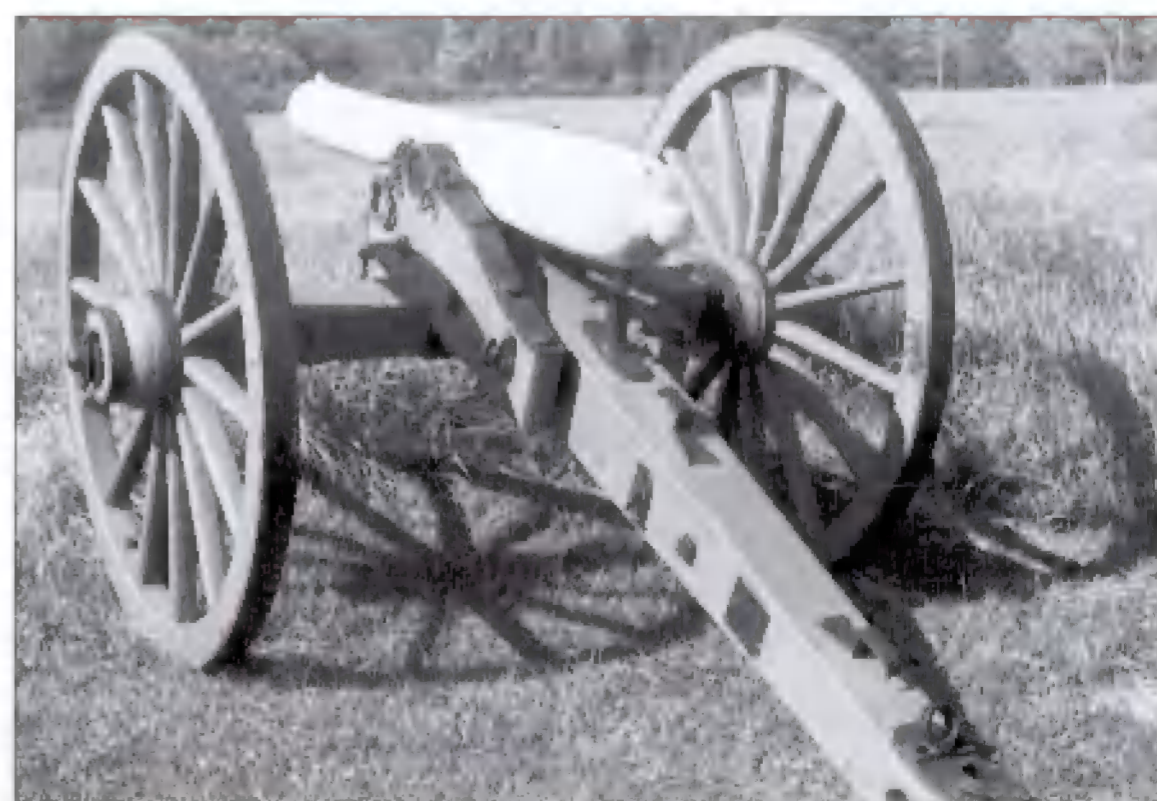
Two Napoleons cast and marked by the Charleston, South Carolina, Arsenal are known to exist today. One is dated 1863 and the other, a year later. The weapons cast in this arsenal likely saw use with forces defending the coastline. In May, 1863, Col. A. J. Gonzales, wrote to the commander of defending forces in that city that: "as soon as Napoleon guns are procured, of which four will soon be cast at the Charleston Arsenal, I will have the honor to earnestly advocate ... the formation of batteries of horse artillery, with four Napoleons each ..." All of these other southern-made Napoleons also lack the muzzle swell found in U.S. Army versions.

In November, 1863, northern forces captured the vital copper mines in Ducktown, Tennessee, something that brought an instant halt to the casting of bronze Napoleons in the south. Tredegar's experts produced an experimental version of the Napoleon made of iron, with a two-inch thick breech reinforcement added for extra strength. Heavier than the bronze model, the iron Napoleon proved serviceable. After testing in March, the Ordnance Department authorized the making of iron Napoleons with a higher priority than any other type of artillery. One Richmond Howitzers member later recalled that: "the iron gun was not only equally safe from explosion, but soon accomplished every purpose against the foe possible with the brass gun and did not create the sharp, piercing ring so severe as not infrequently caused blood to break from the ear of the cannoneer."

Despite the number of Napoleon makers in the south, the major supplier of Confederate artillery was the U.S. Army. Lt. Col. Arthur Fremantle, Coldstream Guards, visited Lee's Army of Northern Virginia in July, 1863, noting that: "The artillery is of all kinds - Parrots [*sic*], Napoleons, rifled and smooth bores, all shapes and sizes. Most of them bear the letters U.S., showing that they have changed masters." Confederate artillerymen preferred to use the higher quality U.S. Army-issue weapons rather than southern-made ones. Private Joseph Garey, Hudson's Battery, recorded a typical reaction to southern-made cannon in his diary on October 17, 1861: "We received our howitzers last night. They proved of a very inferior quality, especially the wood work which is too weak to stand hard usage."



A southern-made copy of the Napoleon made by the Macon, Georgia, Arsenal in 1863. (Gettysburg National Battlefield Park)



Rear view showing the elevating screw of a Confederate Napoleon made in 1864. (Gettysburg National Battlefield Park)

THE FEDERAL NAPOLEON

Maker	Location	Number delivered
Ames Manufacturing Co.	Chicopee, MA	103
Cyrus Alger & Co.	Boston, MA	170
Henry N. Hooper & Co.	Boston, MA	370
Miles Greenwood & Co.	Cincinnati, OH	52
Revere Copper Co.	Boston, MA	461
Total		1,156

THE CONFEDERATE NAPOLEON

Maker	Location	Number Delivered
J. R. Anderson Co.*	Richmond, VA	226
Augusta Arsenal	Augusta, GA	c. 130
Charleston Arsenal	Charleston, SC	c. 20
Columbus Arsenal	Columbus, GA	52
Leeds & Co.	New Orleans, LA	12
Macon Arsenal	Macon, GA	53
Quinby & Robinson	Memphis, TN	8
Total		c. 501

*Tredegar Iron Works, cast both brass and iron

GUN RANGES

A comparison in listing of ranges from the CS Ordnance Manual, 1863, and the U.S. Instruction for Field Artillery, 1864.

Weapon	Charge (lb)	Ammunition	Elevation (degrees)	CS Range (yards)	U.S. Range (yards)
6-lb. gun	1.25	Shot	0	318	320
			1	674	675
			2	867	870
			3	1138	1140
			4	1256	1250
			5	1523	1525
12-lb. gun	2.5	Shot	0	325	350
			1	620	660
			2	875	900
			3	1200	1270
			4	1320	1450
			5	1680	1660
12-lb. howitzer 1		Shell	0	195	200
			1	539	540
			2	640	640
			3	847	840
			4	975	975
			5	1072	1070

THE 10- AND 20-PDR. PARROTT RIFLE

A West Point graduate who had resigned his commission in 1836 to head a private foundry, Robert P. Parrott developed this simple, rugged, and effective weapon. Essentially his design was a long, cast-iron tube with a wrought-iron reinforcing wedge-shaped bar wrapped around the breech, and the joints pounded together until welded shut. In the process, the tube was rotated on rollers, a stream of water being shot inside to keep the tube cool, as the hot band was wrapped around it. Because the tube rotated, the band cooled and clamped itself to the breech uniformly, instead of being tighter where the weight pulled the band down on the top of a stationary piece, while the bottom part was less tightly bound to the tube.

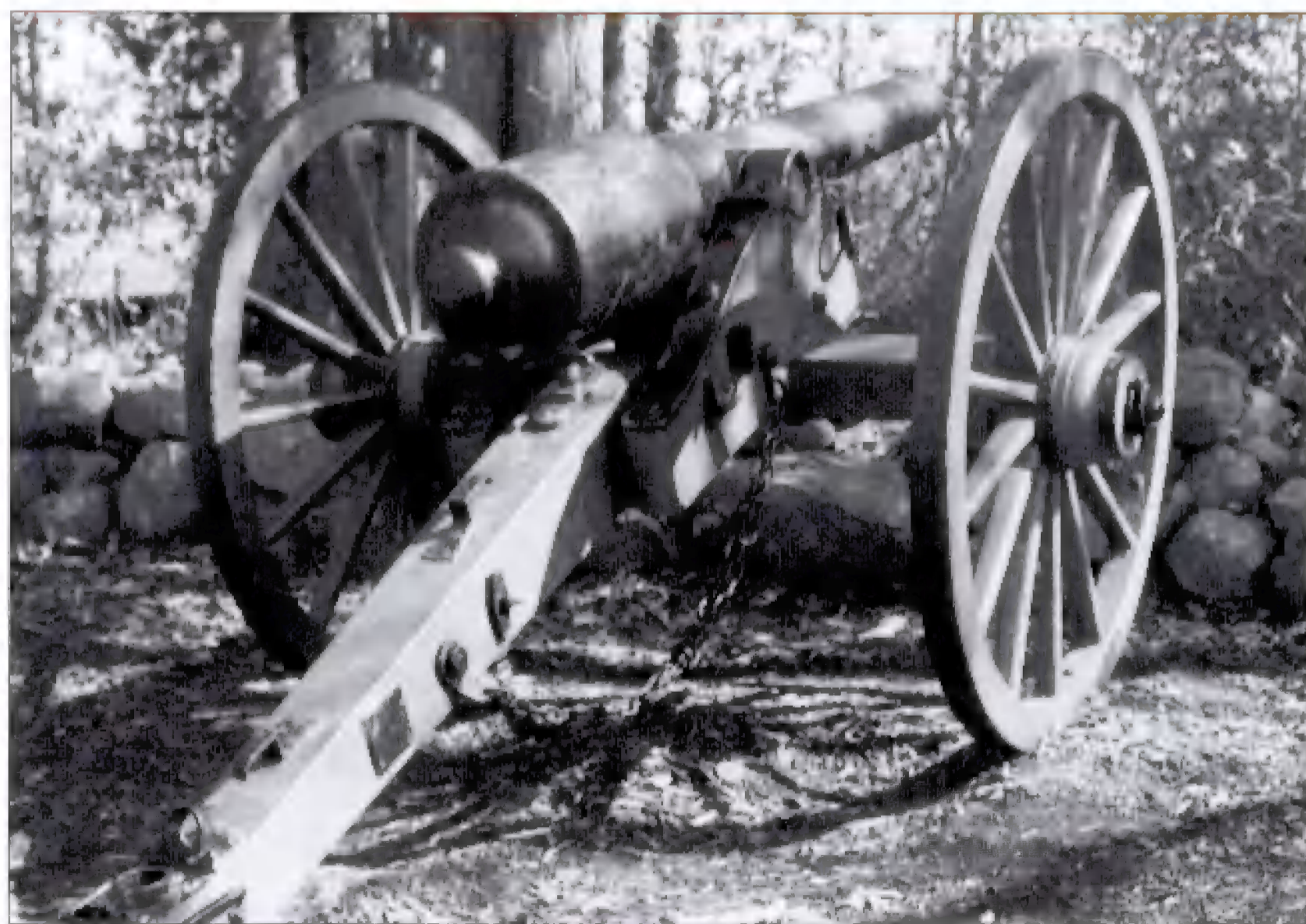
The band allowed the breech to absorb greater stress than an unbanded, or even typically banded cannon. Indeed, the weapon was known as a tough cannon that could take a beating and remain in use. Easy and cheap to produce, they were manufactured at the West Point Foundry under Parrott's supervision.

The Parrott was not a total success, however. In October, 1865, the Chief of Ordnance reported that: "The many failures, by bursting, of the celebrated Parrott guns in the land and naval service have weakened confidence in them, and make it the imperative duty of this department to seek elsewhere for a more reliable rifle gun." This was apt to happen after prolonged service and the weak spot was usually just ahead of the breech band. At least one 20-pdr. Parrott in Massenburg's Georgia Battery burst at its muzzle on the second day of the siege of Chattanooga, so it was not always the breech that burst. The larger weapons were, however, more liable to burst than the standard field 10-pdrs., although none could be wholly trusted.

Parrott himself addressed the problem on June 21, 1864, writing to Maj. Gen. J. G. Foster:

"Though I suppose most of the points of importance in regard to the service of my guns are by this time understood, there are one or two that are of such exceeding interest that I am induced to mention them. The greatest difficulty now to be encountered is in the premature explosion of shells in the bore of the gun. The charge of powder they will hold is quite large, and owing to the elongated form of the projectile or to its being driven into the grooves, there seems to be a tendency of the parts of the broken shell to wedge in the bore, thus carrying away muzzle or some other part,

The 20-pdr. Parrott rifle could be quickly spotted in the field by its massive breech. Markings indicate that this tube weighs 1,974 pounds. (Gettysburg National Battlefield Park)





A view of a 10-pdr. Parrott rifled cannon. (Gettysburg National Battlefield Park)

charge of the shells is violently thrown back, and explosion is caused by the friction or attrition of the powder against the rough surface of the bottom and sides of the shell. These are made smooth by the lacquer or varnish, &c."

Nor was the distrust universal. Cannoneer John D. Billings, 10th Massachusetts Battery, recalled that in August, 1864, his battery was re-equipped with 10-pdr. Parrotts: "They were beauties and gained our regard at once," he wrote, "completely usurping the place the Rodmans [3-in. Ordnance Rifles] had held there."

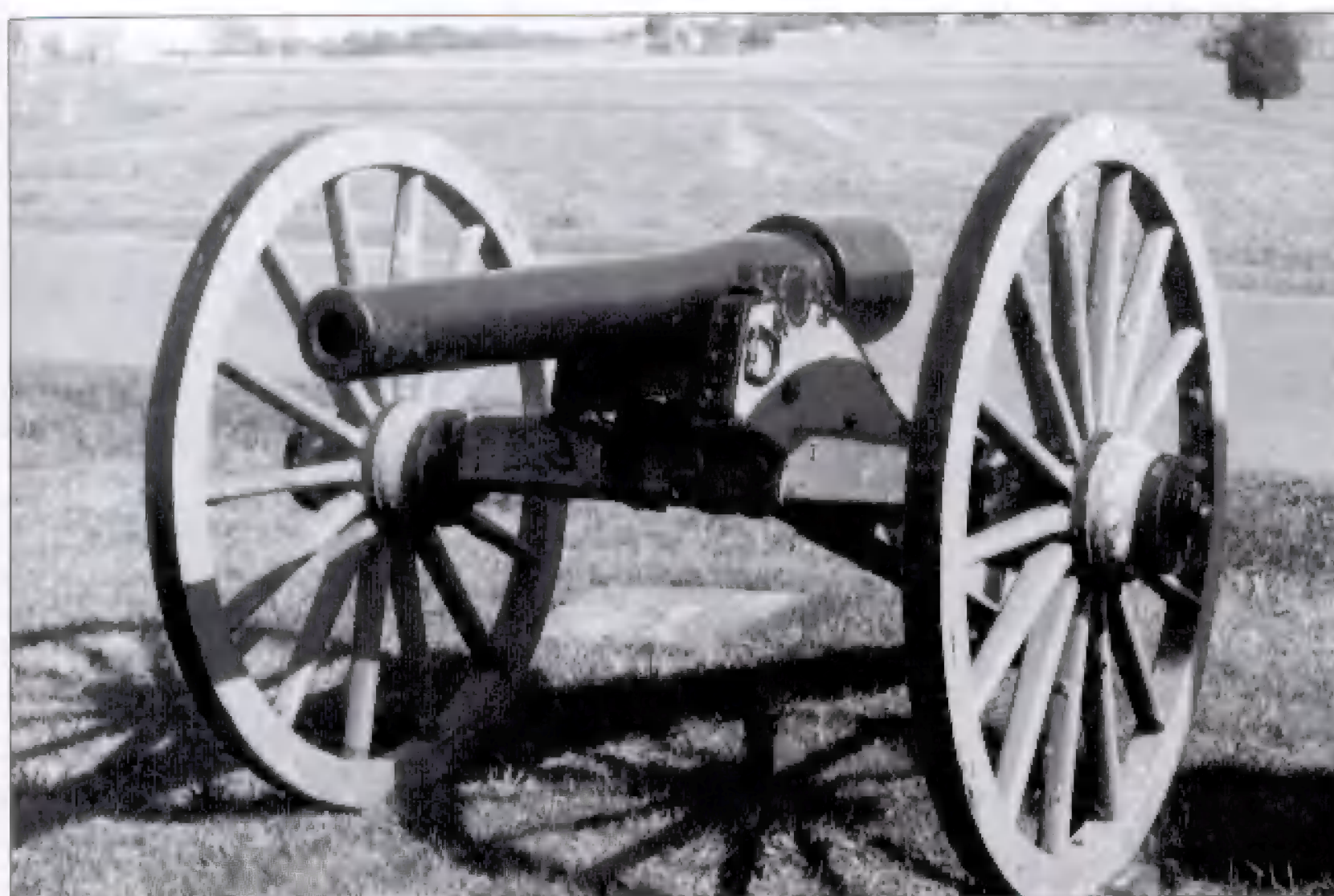
The first Parrott, a so-called 10-pdr., was produced in 1860 and the weapons went into full-time production in 1861. While the 10- and 20-pdrs. were the standard field piece, Parrott also built 30-, 100-, 200-, 300-, and even a 600-pdr. version of the same weapon. The first version of

or, at any rate, giving the gun a violent strain which is afterward and perhaps by other accidents developed into the destruction of the gun. As a means of diminishing this danger, I am now lacquering or varnishing the interior surface of the shells. Even when freshly put in it operates favorably. A little poured in at the fuse hole and then caused to run over the sides by laying the shells down and rolling it will answer. The reason for this seems to be that on firing the gun the powder

the 10-pdr. weapon had a 2.9-in. bore with three lands and grooves of around the same size. This version was marked by a slight muzzle swell. In 1863 a newer version, one that remained standard throughout the war, appeared with a 3-in. bore, three lands and grooves, and no muzzle swell. The U.S.-issue weapons are marked with a date and the initials "RPP" and "WPF".

The 20-pdr. had a 3.67-in. bore with five lands and grooves. They were marked "20-Pdr." on the left trunnion, although

This 10-pdr. Parrott rifle was made in 1863. (Gettysburg National Battlefield Park)



their massive breeches made them clearly identifiable in any gun park. One period expert noted that: "The 20-pdr. Parrott ... proved to be too small to give the precision of fire demanded of a siege gun and to be too heavy for convenient use as a field gun. Moreover, its projectiles did not seem to take the grooves as well as those of either smaller or larger calibers. The gun was accordingly not regarded with favor." Indeed, after Antietam, most of the 20-pdrs. in the Army of the Potomac were replaced with 10-pdr. Parrotts or 3-in. Ordnance Rifles.

In 1862 alone, the army bought 344 Parrott guns of various sizes. Indeed, by that year's end, the army had purchased 411 Parrott field guns, 108 siege guns, and 38 sea coast defense guns. The Parrott, then, was among the most common of all Union field pieces, despite its problems.

The ease of making such cannon did not escape the Confederates, and J. R. Anderson & Co. cast copies at its Tredegar Iron Works in Richmond beginning in November, 1861. The first ones cast were 6-pdr. versions of the weapon, a bore size they continued to produce until August, 1862. In July they cast their first 30-pdr. Parrott copy, followed by a 10-pdr. in August. All told, by the war's end the works had produced some 58 copies of the 10-pdr. Parrott rifle and 45 copies of the 20-pdr. largely for use in the Army of Northern Virginia.

Starting in August, 1863, the Macon Arsenal made around a dozen copies of the 10-pdr. Parrott mostly for the Army of Mississippi. The Arsenal also cast some 20- and 30-pdr. Parrotts as well. The chief of artillery for the Army of Tennessee, which received a battery of Macon's 10-pdrs. tested these southern-made weapons and found the results were: "so much unsatisfactory that I really do not understand its cause." Rifling was found to be uneven and bore diameter was not uniform. A handful of Parrott copies may also have been produced at the Augusta, Georgia, Arsenal also for the Army of Tennessee use. A private company, Street, Hungerford & Co., Memphis, Tennessee, made at least three, and possibly more, copies of the Parrott gun. Finally, Bujac & Bennett, New Orleans, produced a dozen copies of the Parrott rifle in December, 1861, of which three burst immediately, followed by another eight in March, 1862.

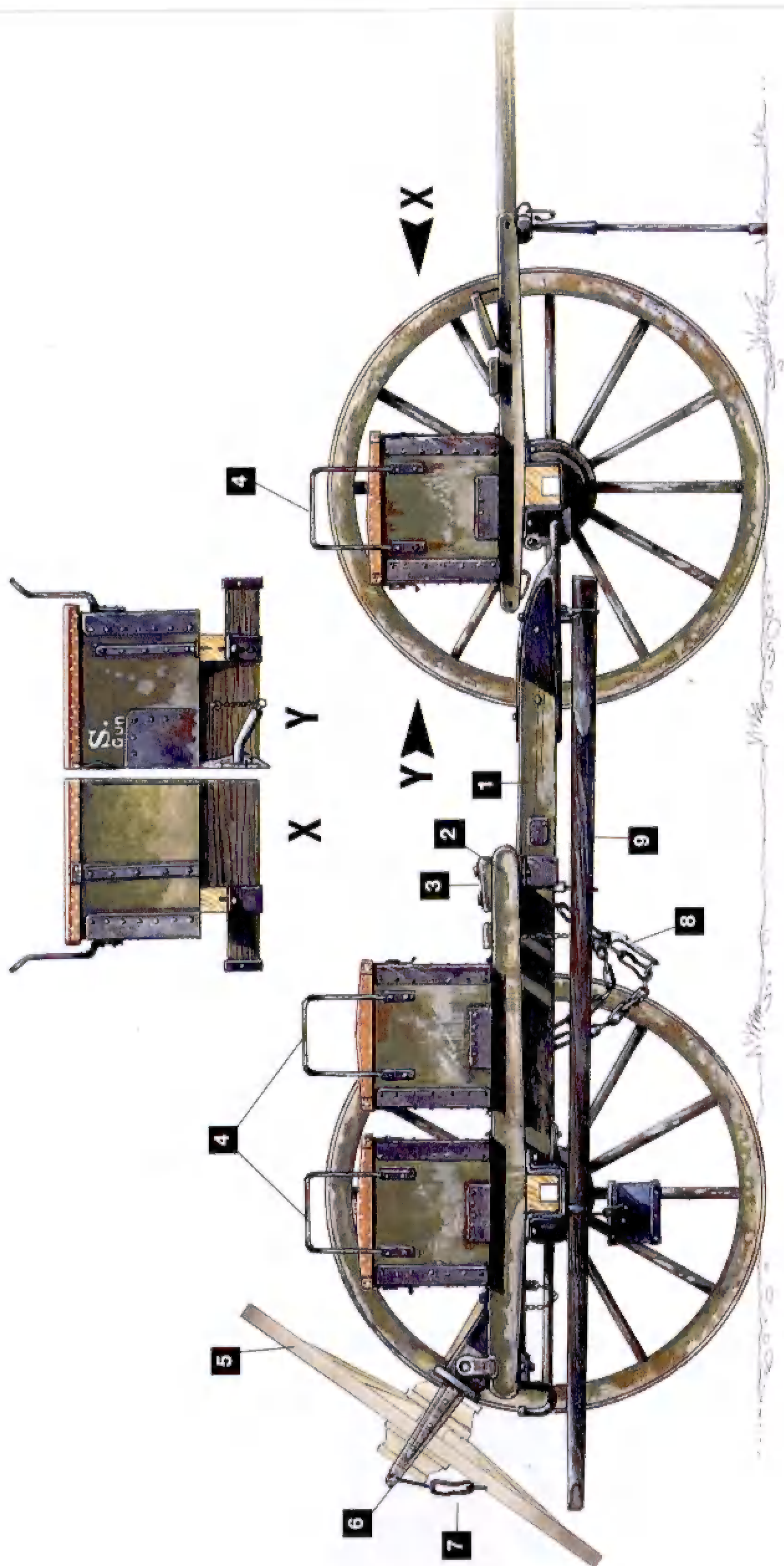
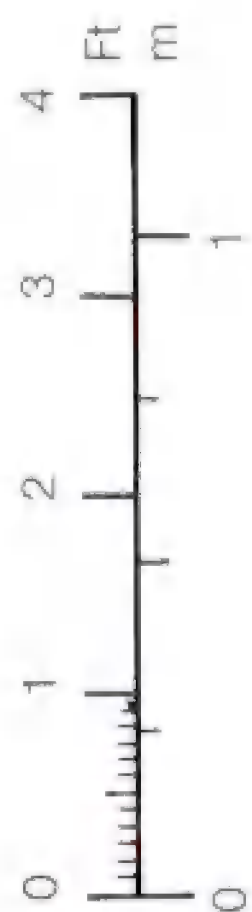


This Southern-made copy of the 10-pdr. Parrott rifle bears the serial number 4 on the muzzle. (Gettysburg National Battlefield Park)



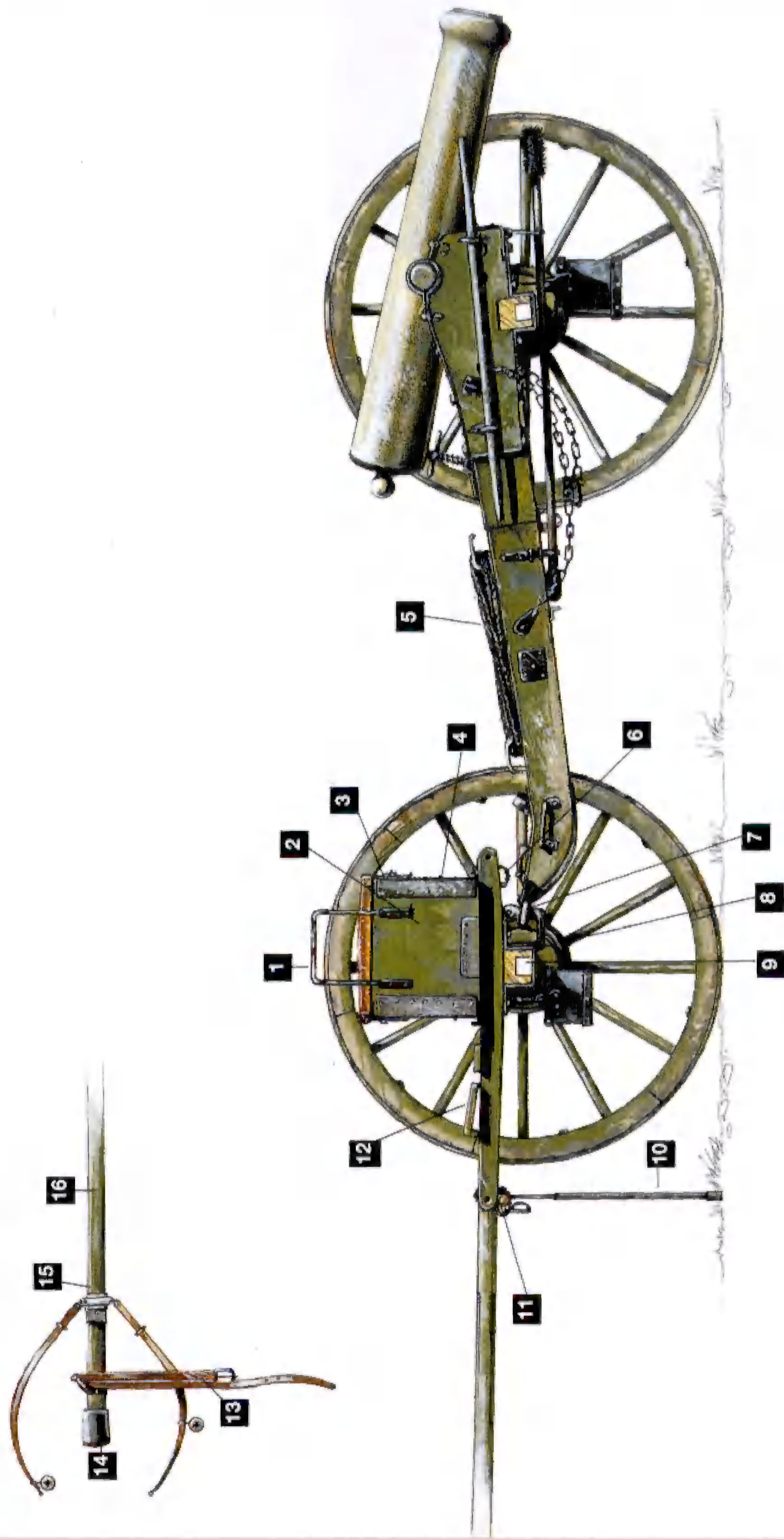
This six-foot-tall man demonstrates the size of the 10-pdr. Parrott rifle. (Gettysburg Battlefield National Park)

A: The caisson and limber attached - a side view.

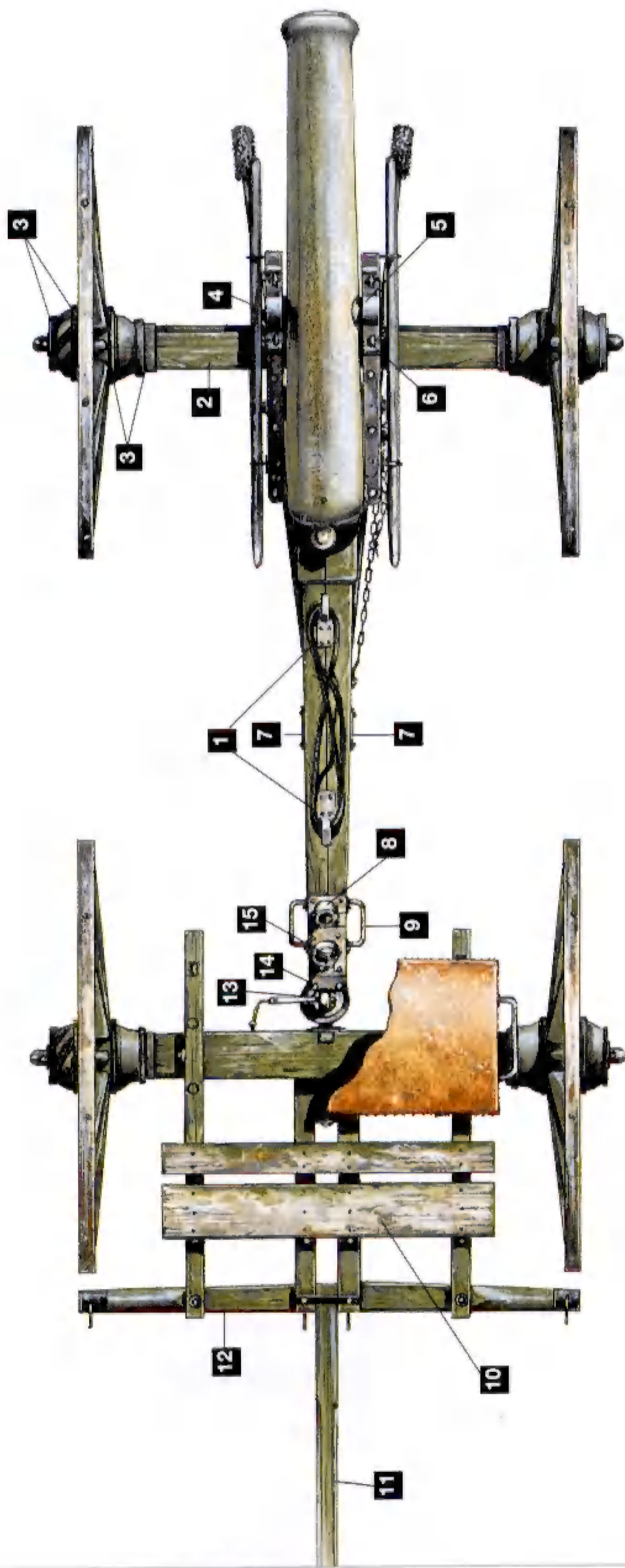
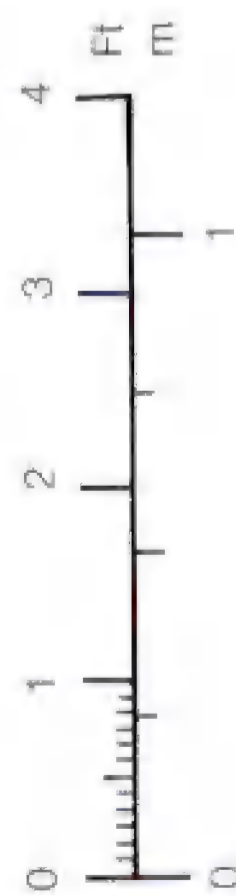




B: The 12-pdr. Napoleon gun attached to the limber - a side view.



C: The 12-pdr. Napoleon gun
attached to the limber -
a top view.



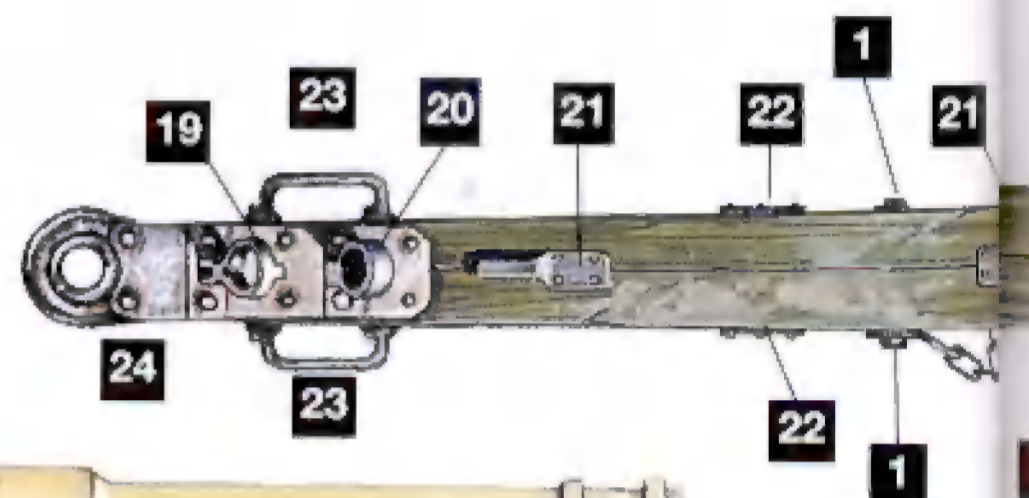
6-PDR FIELD GUN CARRIAGE

KEY

- 1 Lock chain bolt and eye plate
- 2 Part of the lock chain
- 3 Sponge and rammer stop
- 4 Ear plate to support worm, key chain and key
- 5 Box of the elevating screw
- 6 Elevating screw
- 7 Washer hook for handspike
- 8 Linstock socket
- 9 Washer hook for lock chain
- 10 Cap-square chain
- 11 Cap-square
- 12 Cap-square key chain and key
- 13 Trunnion plate
- 14 Handspike ring
- 15 Sponge hook
- 16 Axle body
- 17 Axle tree
- 18 Under strap
- 19 Large pointing ring
- 20 Small pointing ring
- 21 Prolonge hooks
- 22 Wheel guard plate
- 23 Trail handles
- 24 Lunette
- 25 Cheek
- 26 Hub



12-pdr. Howitzer



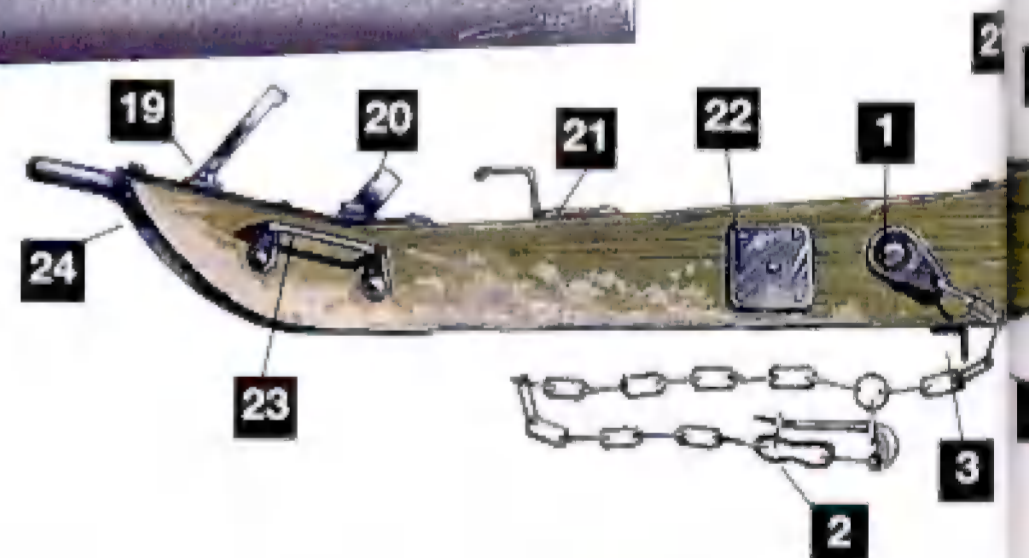
24-pdr. Howitzer



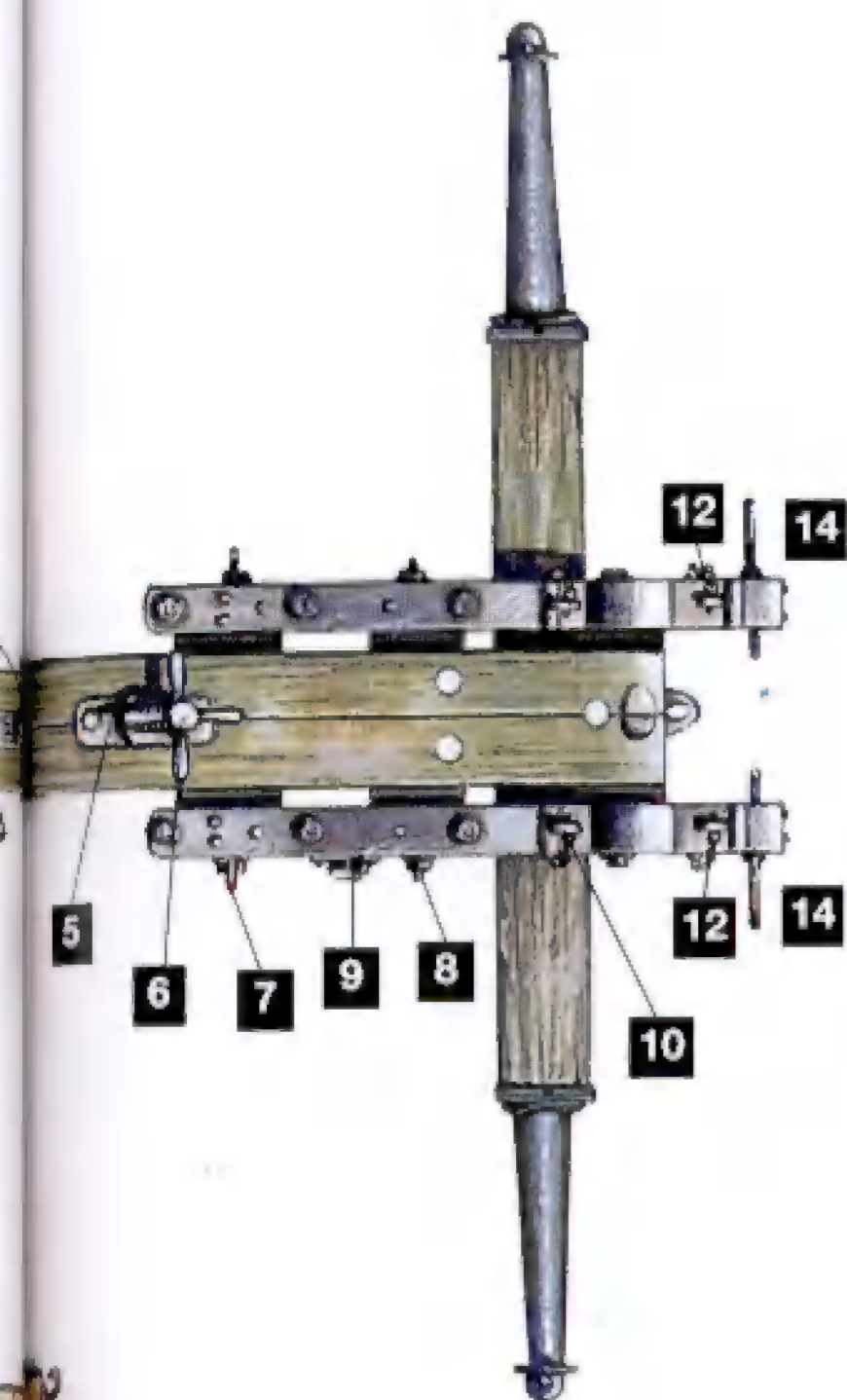
6-pdr. Gun



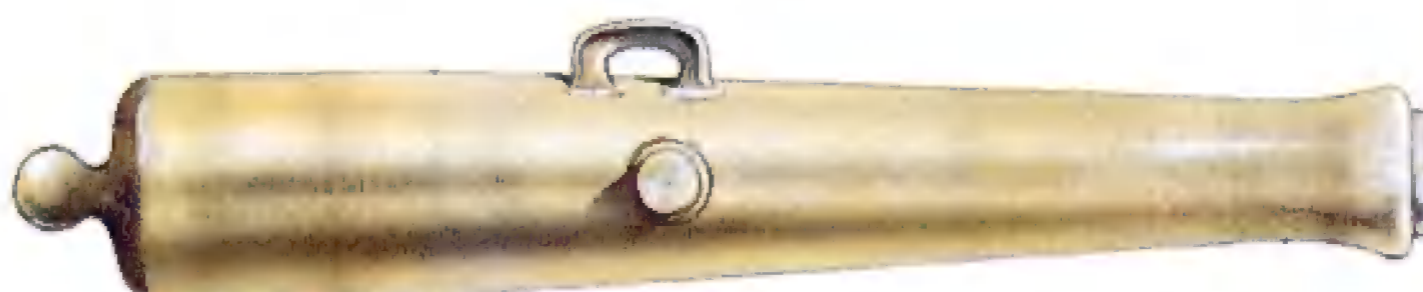
3-in. Ordnance Rifle



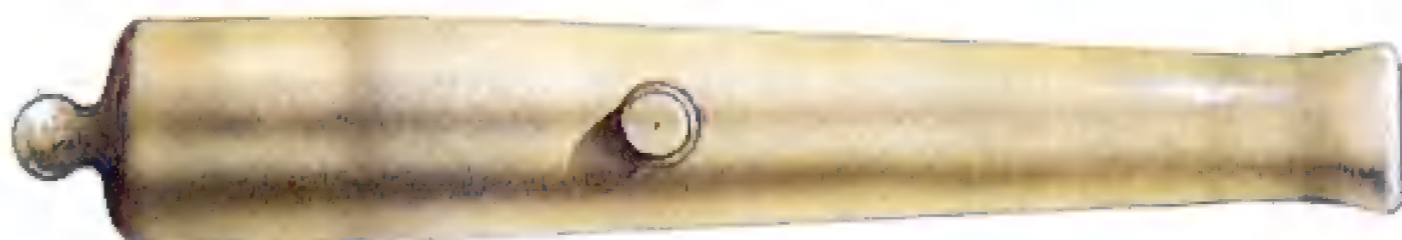
10-pdr. James Rifle



10-pdr. Parrott Rifle



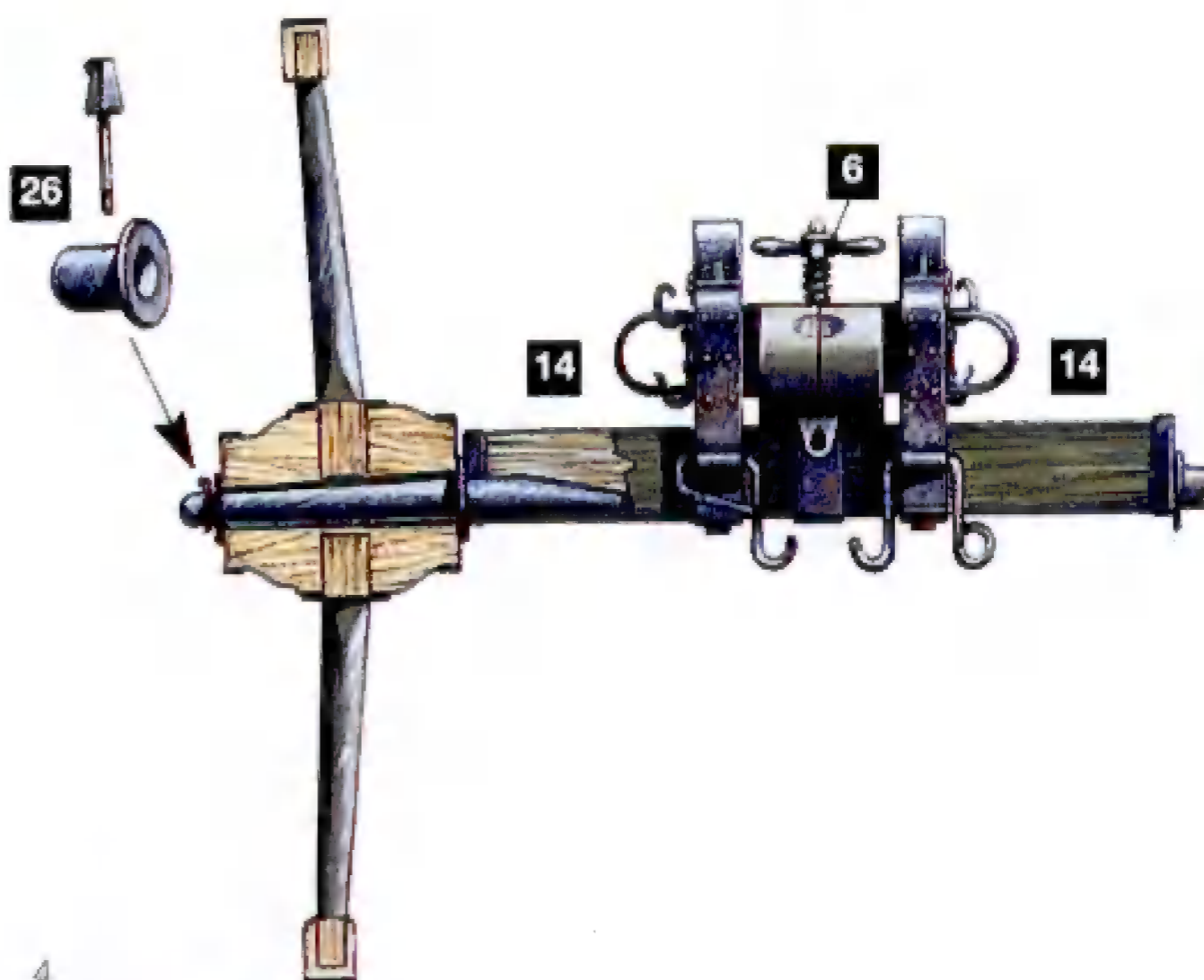
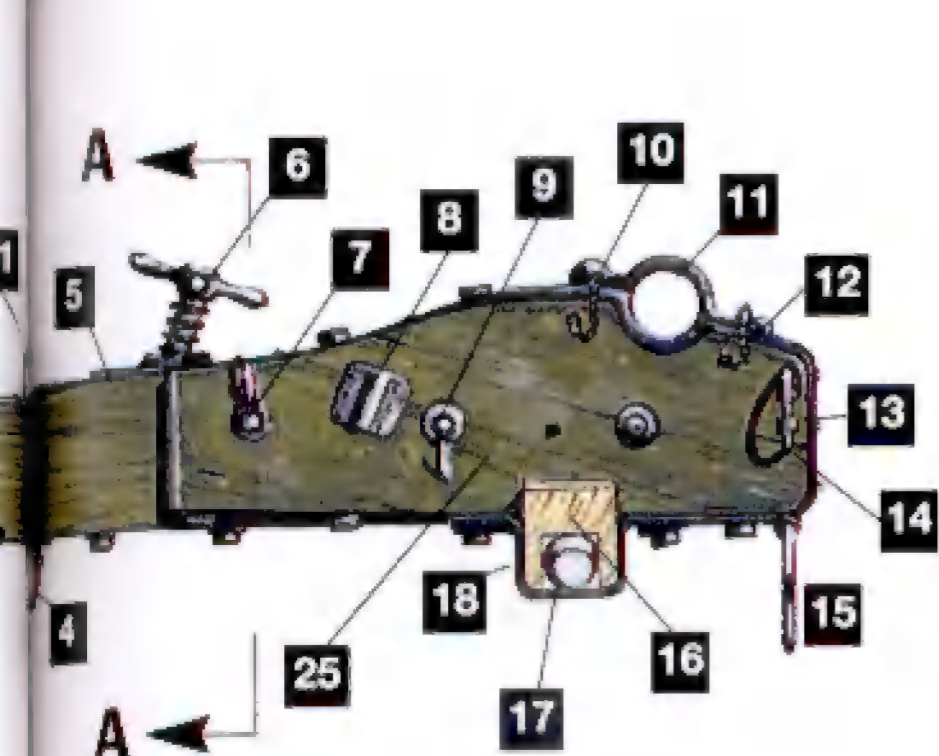
Napoleon Gun-Howitzer
Model 1857 1st Union Type



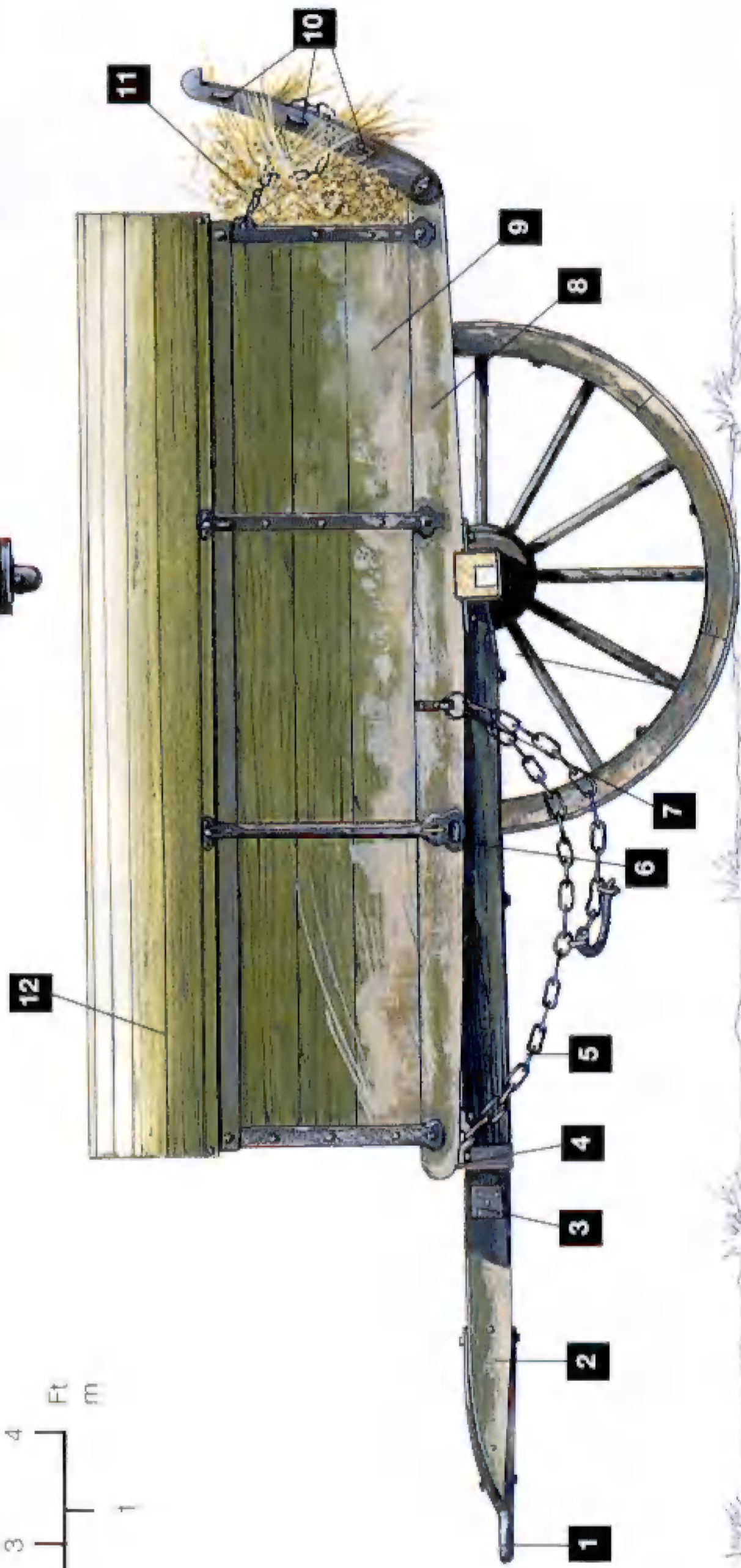
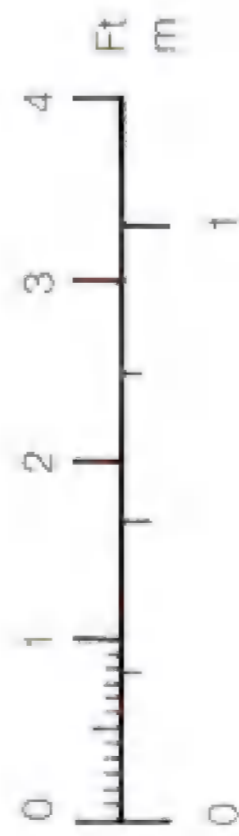
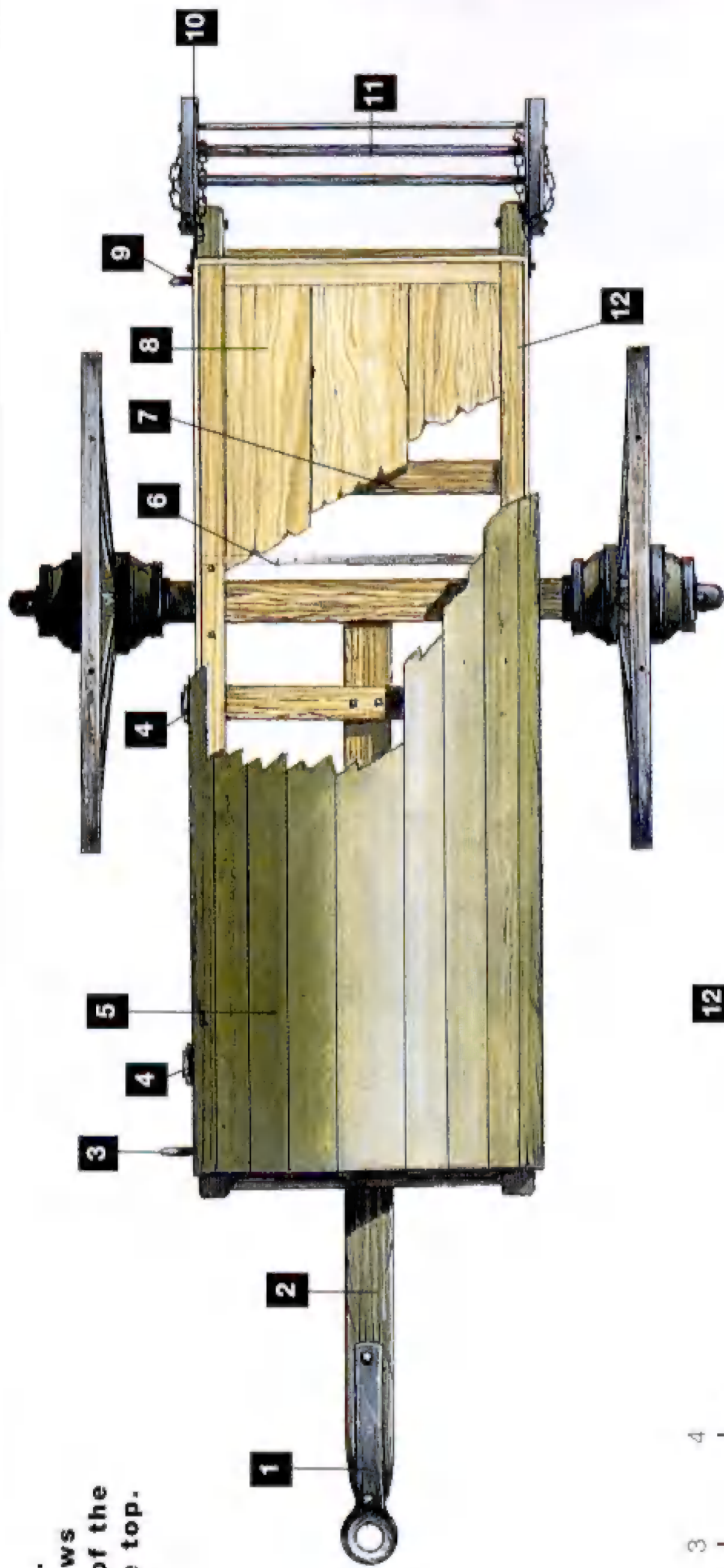
Standard Union Type



Confederate Type

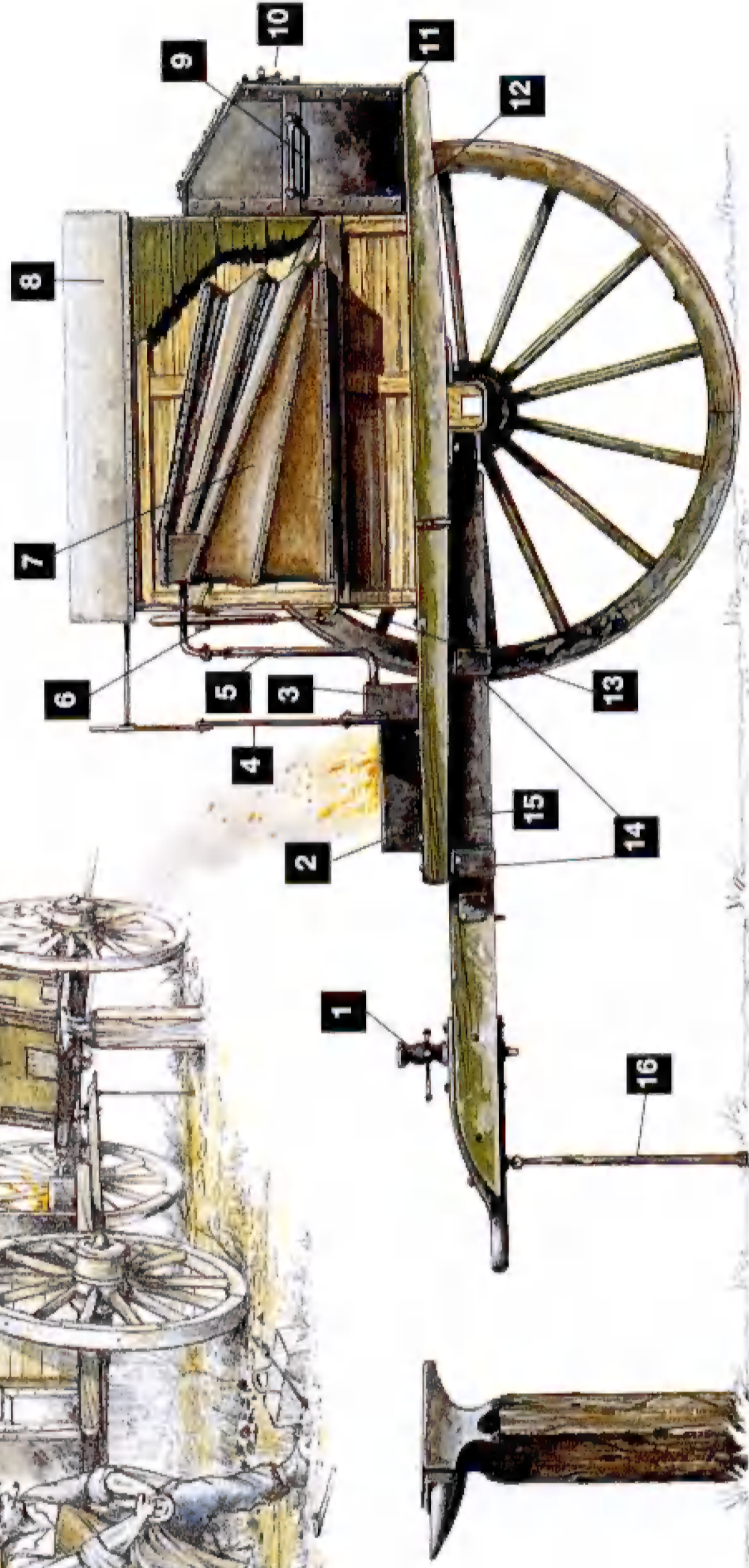
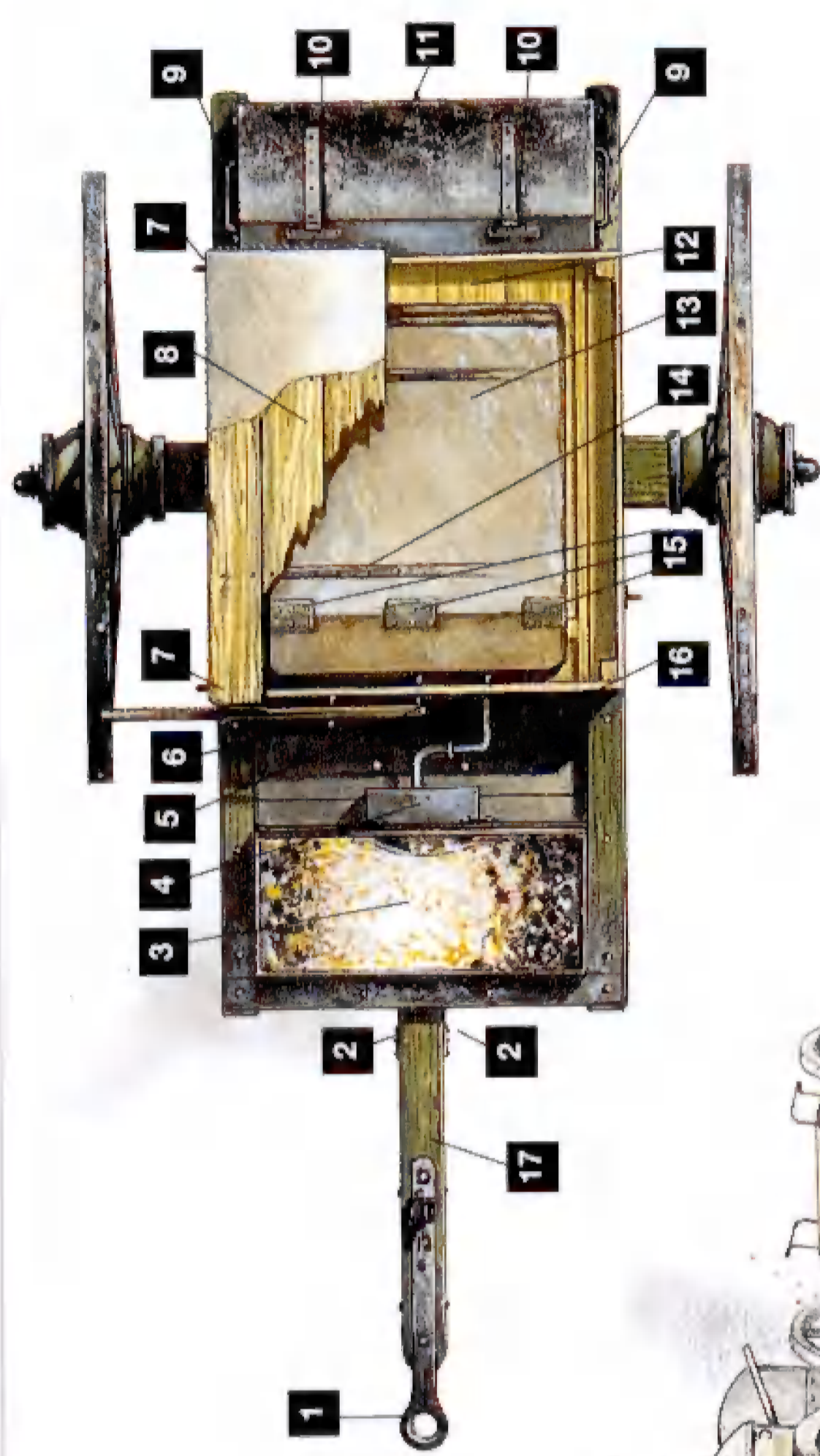
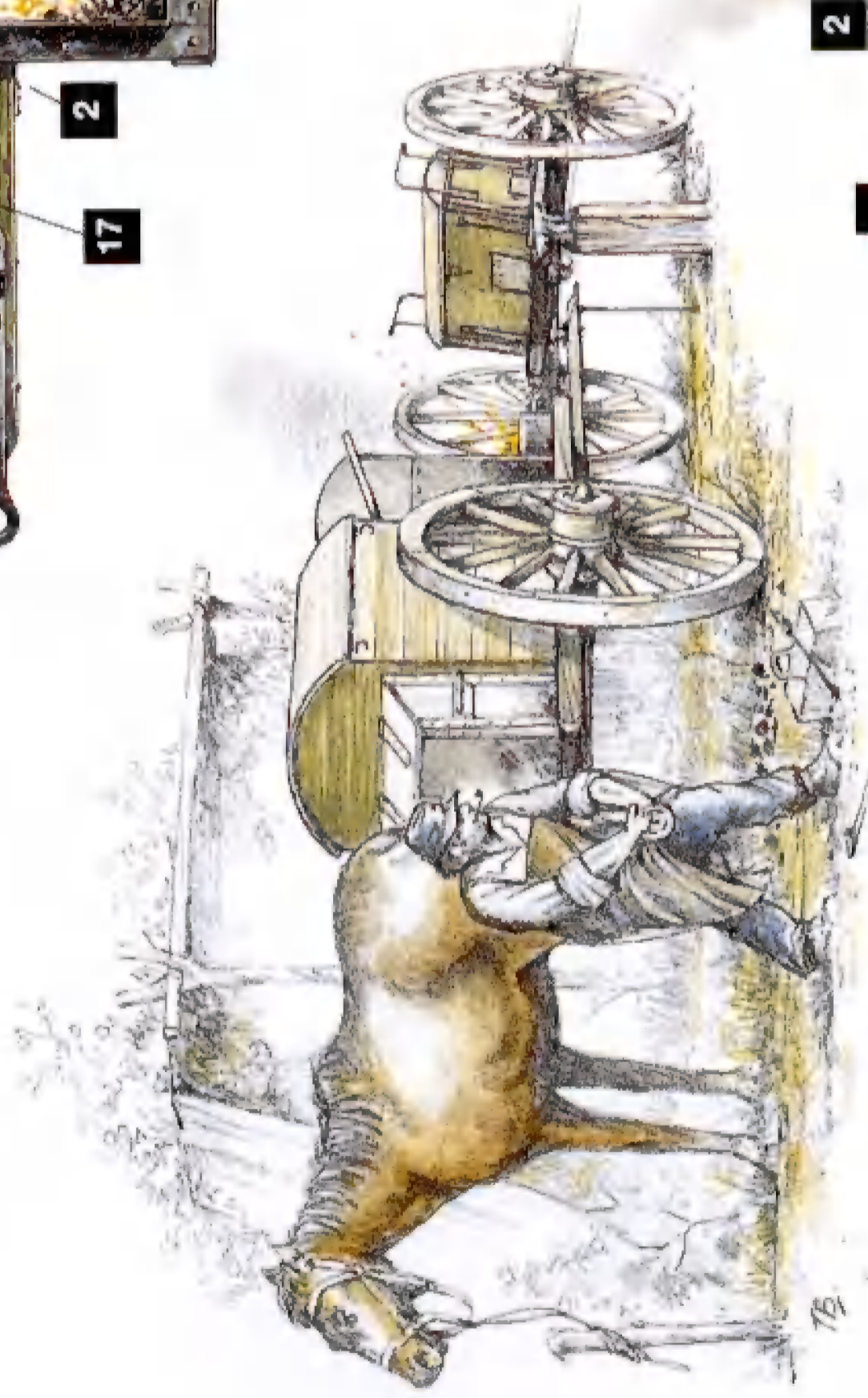


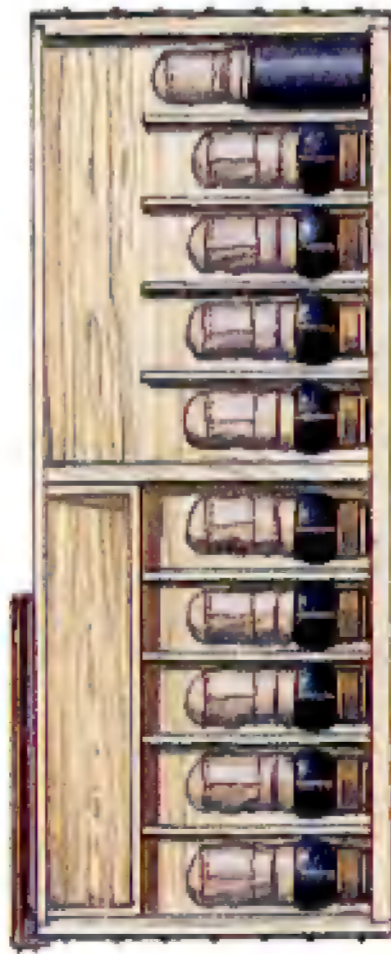
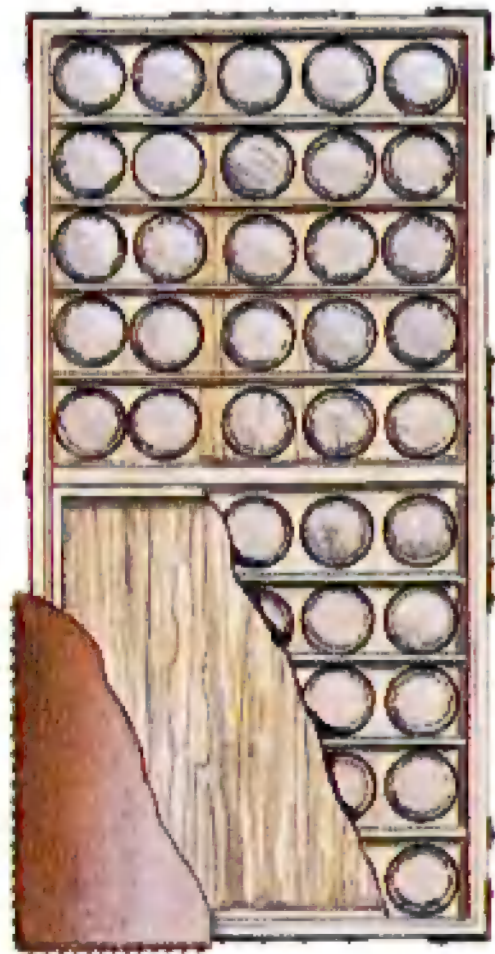
E: A battery wagon.
 Top and side views
 with a cutaway of the
 interior from the top.



Juste *Wagon*

F: The traveling forge -
top and side cutaway
views.

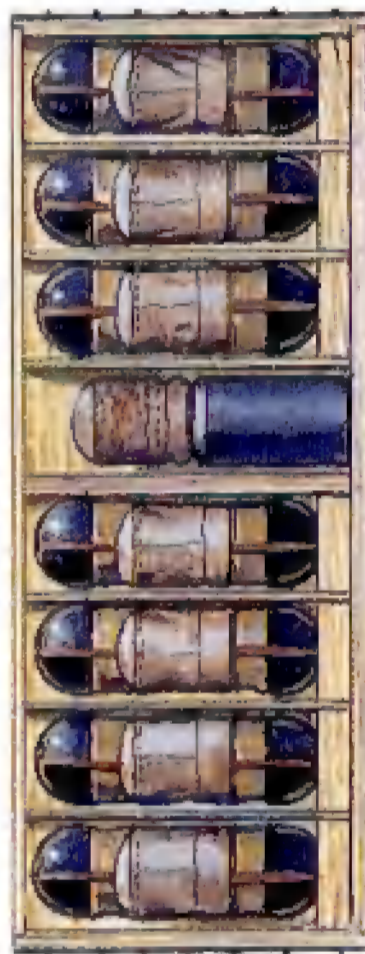




1



2



3



G: Packed limber boxes.

THE 3-IN. ORDNANCE RIFLE

A private citizen, John Griffen, superintendent of the Phoenix Iron Co., Phoenixville, Pennsylvania, developed a system of making artillery in the 1850s that proved highly successful. His foundry took strips of wrought iron some 3/4 of an inch wide and 4.5 inches thick and wrapped them by lathe around an iron core. In all, five layers were built around the core with a thin iron covering on top. Then the core was removed and a plug driven into the breech which not only closed the breech, but also formed the cascabel. Then the mass was heated to welding temperature and up-set two inches in a press. It was rolled out from 4.5 to 7 feet and the bore was reamed out. Trunnions were welded on and the chase turned down to a proper size in a lathe.

The end result was a 3-in. rifled weapon with clean lines and light weight. It was made with 0.5-in.-wide lands and grooves that were 0.84 inches wide. The standard tube weight was 820 lb., although many were slightly lighter. Tests made during the war with a pound of powder and a 9-lb. shell at 10 degrees showed a range of 2,788 yards, while a 20 degree elevation gave the weapon a range of 3,972 yards. It was also an exceptionally safe weapon: only one 3-in. rifle was recorded as having burst in the Union Army during the entire war.

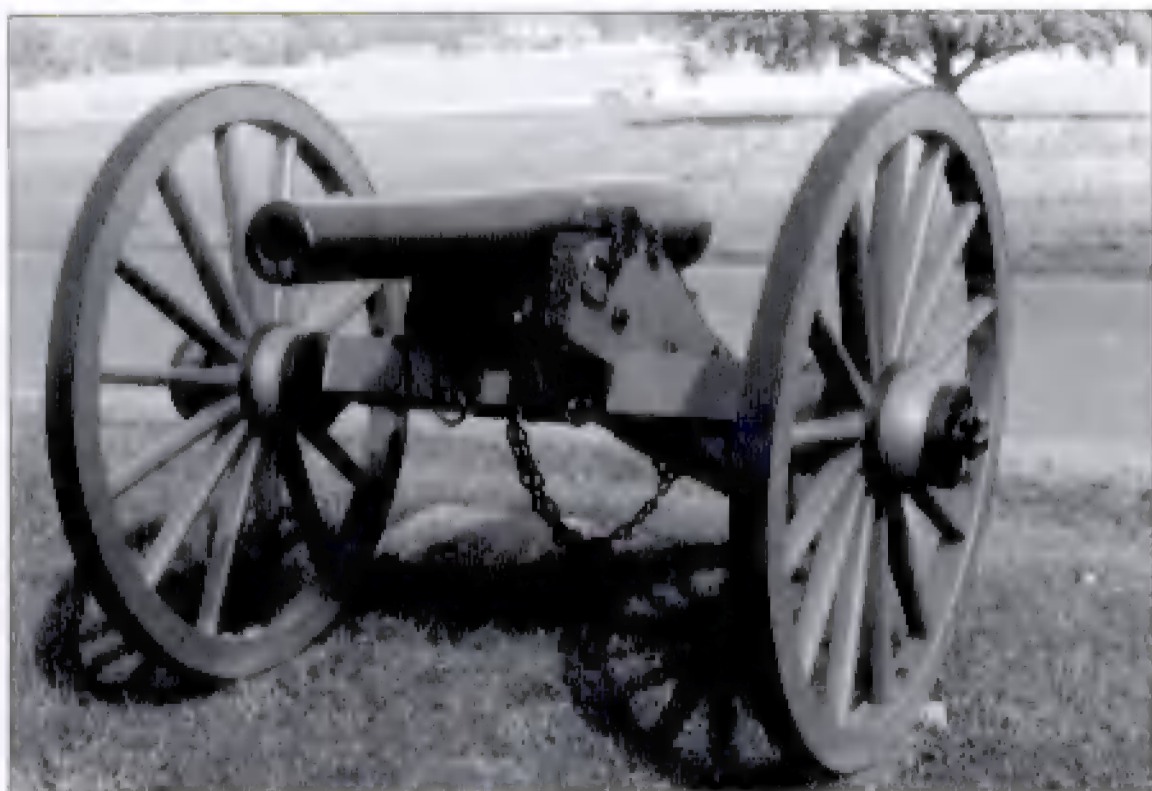
It passed government tests and on June 25, 1861, the Ordnance Department ordered 200 rifled versions of this weapon, and another 100 smoothbores. In fact, the order was quickly changed to make all 300 weapons rifles, and eventually the Phoenix Iron Co. supplied the U.S. Army with 1,100 weapons by the war's end. Each is marked on its muzzle with the inspector's initials, the weapon serial number, the weight, "PICO," and the date of manufacture. They were called both Ordnance Rifles and 3-in. Rifles by their users.

These weapons were popular with users on both sides. Brig. Gen. George D. Ramsay, Chief of Ordnance, reported that: "The experience of wrought iron field guns is most favorable to their endurance and efficiency. They cost less than steel and stand all the charge we want to impose on them ..." Confederate artilleryman E. Porter Alexander referred to "the beautiful United States Three-Inch Ordnance Rifles." And Confederate Army Headquarters reported at the end of 1861 that, "The outstanding orders for artillery embrace 15 15-inch columbiads, 220 10-inch columbiads, 340 8-inch columbiads, 70 8-inch siege

howitzers, 158 3-inch rifle guns, 24 12-pdr. howitzers, 40 24-pdr. howitzers, 20 10-in. howitzers, 80 42-pounder siege guns, 100 32-pounder siege guns, and field batteries to the extent of our necessities."

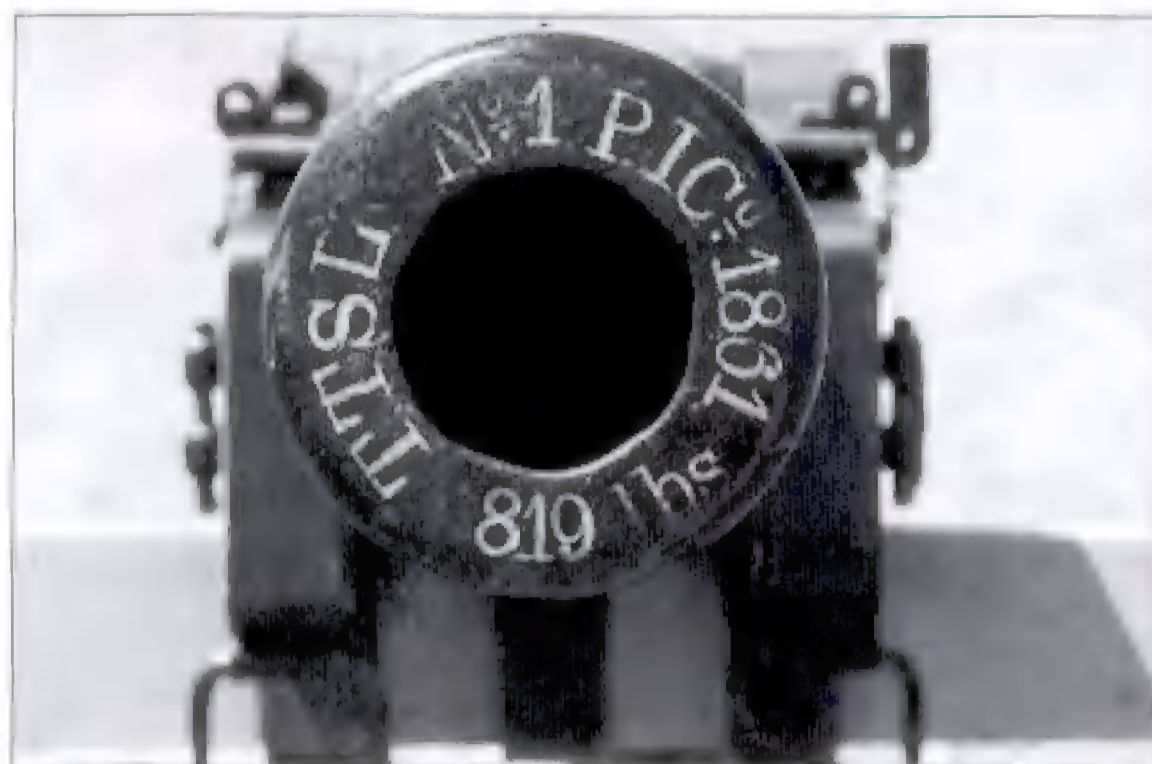
While some Confederate batteries received 3-in. rifles on their foundation, many weapons became southern property through prewar purchases and captures. It was not until January, 1862, that the Tredegar Iron Works cast its first 3-in. rifle, and it produced a total of only 20, none of them after April, 1862. Noble Brothers & Co., Rome, Georgia, a private contractors, started manufacturing 3-in. rifles in 1861, producing

A 3-in. Ordnance Rifle made in 1863. (Gettysburg National Battlefield Park)



18 of them for both Richmond and Augusta Arsenals between April, 1861, and October, 1862, when they ceased production.

Quinby & Robinson, of Memphis, Tennessee, another private concern, produced four versions of the 3-in. rifle using bronze as the barrel metal between November, 1861, and June, 1862, when the city was captured by Federal forces. Bronze was also used as the barrel metal for the three 3-in. rifles produced in 1862 by A. B. Reading & Brother, Vicksburg, Mississippi, which saw use in the Army of Mississippi. The Bellona Foundry also cast some bronze and iron 3-in. rifles, known in the Confederate service as "Burton and Archers," but these were especially prone to bursting. The term "Burton and Archer" came from the special ammunition designed for these weapons.



Muzzle of the first 3-inch Ordnance Rifle ever produced. This particular weapon was captured at Gettysburg. (George Lomas Collection)

THE M1841 12-PDR. HOWITZER

The smoothbore howitzer was designed as a lightweight gun suitable for use with canister or shell at short ranges, or at a higher trajectory than regular guns; it was therefore able to hit targets in greater defilade than regular guns. The Model 1841 12-pdr. howitzer, with its bronze 65 in.-long tube that weighed 788 lb., fired an 8.9 lb. shell 1,072 yards at five degrees elevation with a one-pound charge of powder. The weapon was not popular with artillerymen who were forced to engage in counter-battery fire against superior Napoleons, 3-in. rifles, and Parrott guns.

In March, 1864, Army of Northern Virginia chief William Pendleton inspected the artillery of the Army of Tennessee and reported that 12-pdr. howitzers were "scarcely more valuable" than 6-pdr. smoothbores, which he called "nearly useless, if not indeed worse." At that time about a quarter of the army's artillery park consisted of 12-pdr. howitzers. Pendleton felt that the howitzers were useful only in broken wooded country, and therefore called for the replacement of many of the weapons then in use. Lee agreed, suggesting that they be melted down to make new Napoleons. Nonetheless, many remained in the Confederate service until the war's end, and E. Porter Alexander mentioned rigging up his howitzers on skids, aimed at high elevations, to use them successfully as mortars.

The howitzer was also useful in close defense. Writing about artillery in

Another view of the 3-in. Ordnance rifle. (Gettysburg Battlefield National Park)





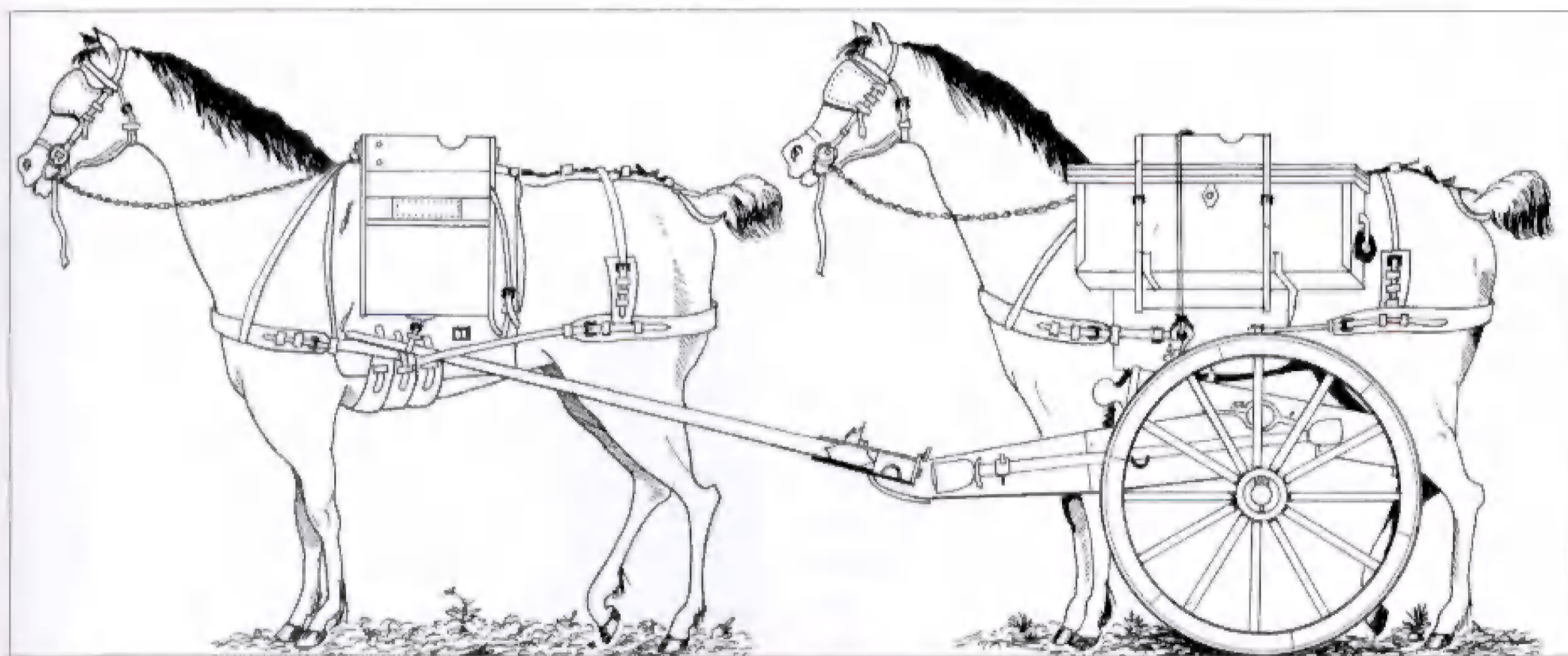
A 12-pdr. Confederate-made howitzer. (Gettysburg National Battlefield Park)

the Petersburg campaign, Union artillery general Henry Abbot claimed that in being attacked: "no artillery can be more efficient than the 32-pdr. or 24-pdr. field howitzer." He went on to mention being attacked at a post held by a company of the 1st Connecticut Heavy Artillery, armed with two 32-pdr. and one 24-pdr. howitzers in which "so rapid a canister fire was maintained as to repulse the column with severe loss."

The Confederates developed the Model 1862 12-pdr. field howitzer which had an iron 64.4 in.-long tube with a bore of 4.62 inches and a weight of 850 pounds. They actually first cast these at the Tredegar Iron Works in November, 1861, and later began casting bronze 12-pounders, too. In all, the Tredegar Iron Works cast some 30 iron versions, none after June, 1862, and 34 bronze versions, none after November, 1862.

Some private southern concerns also cast 12-pdr. howitzers, among them T. M. Brennan & Co., of Nashville, Tennessee, which cast 20 of them before the foundry was captured. In Memphis, Tennessee, Quinby & Robinson turned out 43 12-pdr. howitzers, the last three of which were unfinished when the factory burned down, ending production. John Clark & Co., of New Orleans, cast a number used in western armies before that city's fall. Another New Orleans firm, Leeds & Co., produced nine 12-pdr. howitzers in the same period. The Columbus (Georgia) Iron Works cast at least a couple of brass howitzers, one made from household brass items donated by local ladies. Noble Brothers & Co., Rome, Georgia, turned out 14 12-pdr. howitzers in 1861-62. A. B. Reading & Brother, Vicksburg, Mississippi, delivered a pair of 12-pdr.

The Ordnance Manual drawing of the 12-pdr. mountain howitzer on its carriage as well as the pack saddle used to carry the tube shown on the first horse, and the two limber chests on the second horse.





A captured Confederate 12-pdr. howitzer complete with limber. (Library of Congress)

howitzers in 1861–62. Washington Foundry, Richmond, produced ten bronze rough-finished 12-pdr. howitzers in 1862 that were finished in the Richmond machine shop of Samson & Pac.

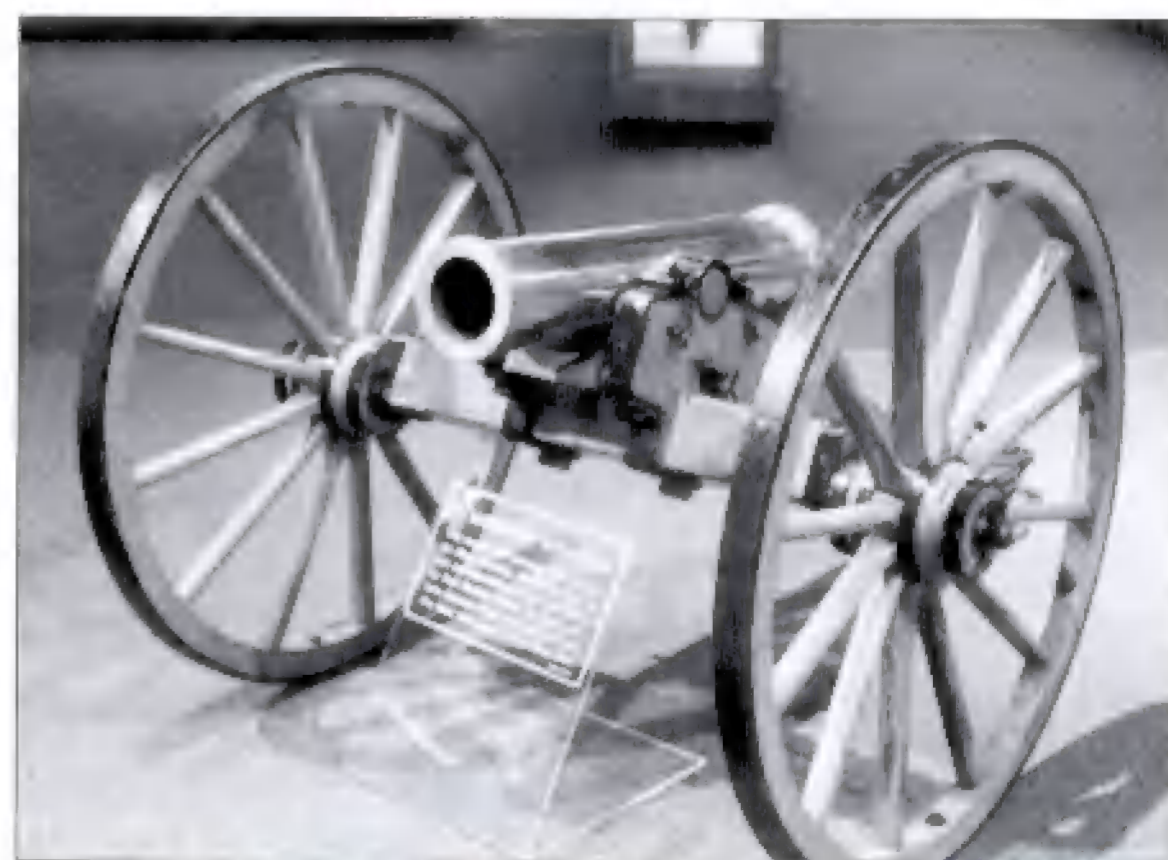
As indicated by Abbot, the howitzer was mainly a defensive weapon, and although many were used in the field in the early part of the war since any weapon that could fire was needed, they saw less and less field use as the war went on.

THE MOUNTAIN HOWITZER

The mountain howitzer was a small, lightweight weapon designed to be broken down and carried by pack animals for use in rugged terrain. While it was not of much use in the east, where it would be subject to counterbattery fire, it was popular in the west especially against Indians who did not have access to artillery. These weapons saw only limited use by Union forces, although the Confederates, especially in the west, employed quite a few of them. They were rarely used in the main actions of the war, however, instead seeing action in places like Carnifax Ferry, West Virginia, in 1861; Glorieta, New Mexico; Giles Court House, West Virginia; and Wood Lake, Minnesota, in 1862. In the latter fight the Federals said that they were used “with great effect” against the Sioux. Regular infantrymen on both sides tended to disregard the weapon. One of the South’s leading generals, Patrick Cleburne, reported that during the battle of Richmond, Kentucky, the Union troops: “kept up a ridiculous fire from a little mountain howitzer which they had captured the day before ...”

Most mountain howitzers were used by infantry troops, rather than regular artillery, and acted more as close infantry support weapons than actual artillery. Still, they did appear in the

The M1841 12-pdr. mountain howitzer was designed to be carried in pieces on the backs of three mules. The bronze tube weighed a mere 220 lb., but only had a range of 900 yards at five degrees elevation. It fired a shell weighing almost 9 pounds. They were popular in the west where counterbattery fire was uncommon, but much less so in the east where they were rarely used. The Confederates also cast copies of this weapon. (U.S. Army Ordnance Museum, Aberdeen, Maryland)





A 12-pdr. Dahlgren boat howitzer, foreground. The small iron carriage makes the weapon look rather top-heavy. (George Lomas Collection)

range with canister is 250 yards. According to elevation the range varies from 150 to 1,000 yards; at the same elevation the range with shell being greater than spherical-case. A battery of six mountain howitzers required 33 pack-saddles and harness, and 33 horses or mules. A mountain howitzer ammunition chest will carry about 700 musket ball-cartridges, besides eight rounds for the howitzer."

THE DAHLGREN BOAT HOWITZER

During the Mexican War, the navy took part in a number of landing expeditions, and learned that it needed field artillery of its own. Admiral John Dahlgren, a leading authority on naval artillery, designed a series of boat howitzers that were accepted as the standard U.S. Navy weapon a decade before the Civil War.

These were guns with a bronze tube and a loop under the barrel to secure it either to a field or boat carriage. They were all marked by a lack of a muzzle swell and were available in several sizes, although the 12 lb. shell or shot was common to many of them. The first version had a 4.62-in. bore and weighed 430 lb. by itself and 600 lb. on its special wrought iron carriage.

The medium howitzer had the same bore but weighed 760 lb., or 1,200 lb. on its carriage and was designed for use on frigates. Its range at five degrees was 1,150 yards with case, and 1,085 yards with shell. This was the most popular of this series of cannon.

A lighter version was adopted that weighed 300 lb., while another standard 12-pdr. with a 3.4-in. bore and weighing 880 lb. was also adopted for use on sloops. A light 12-pdr. weighing 300 lb and a rifled bronze 12 pdr. weighing 880 lb were also made during the war. A 20-pdr. with a 4-in. bore and weighing 1,340 lb. was also adopted. During the war a number of rifled 20-pdrs. weighing 1,340 lb. were acquired by the Navy.

The boat howitzer was designed to be mounted on the bow of a launch to fire on an enemy as the

Detail of the elevating screw and wheel at the end of the carriage of the 12-pdr. Dahlgren boat howitzer. (George Lomas Collection)

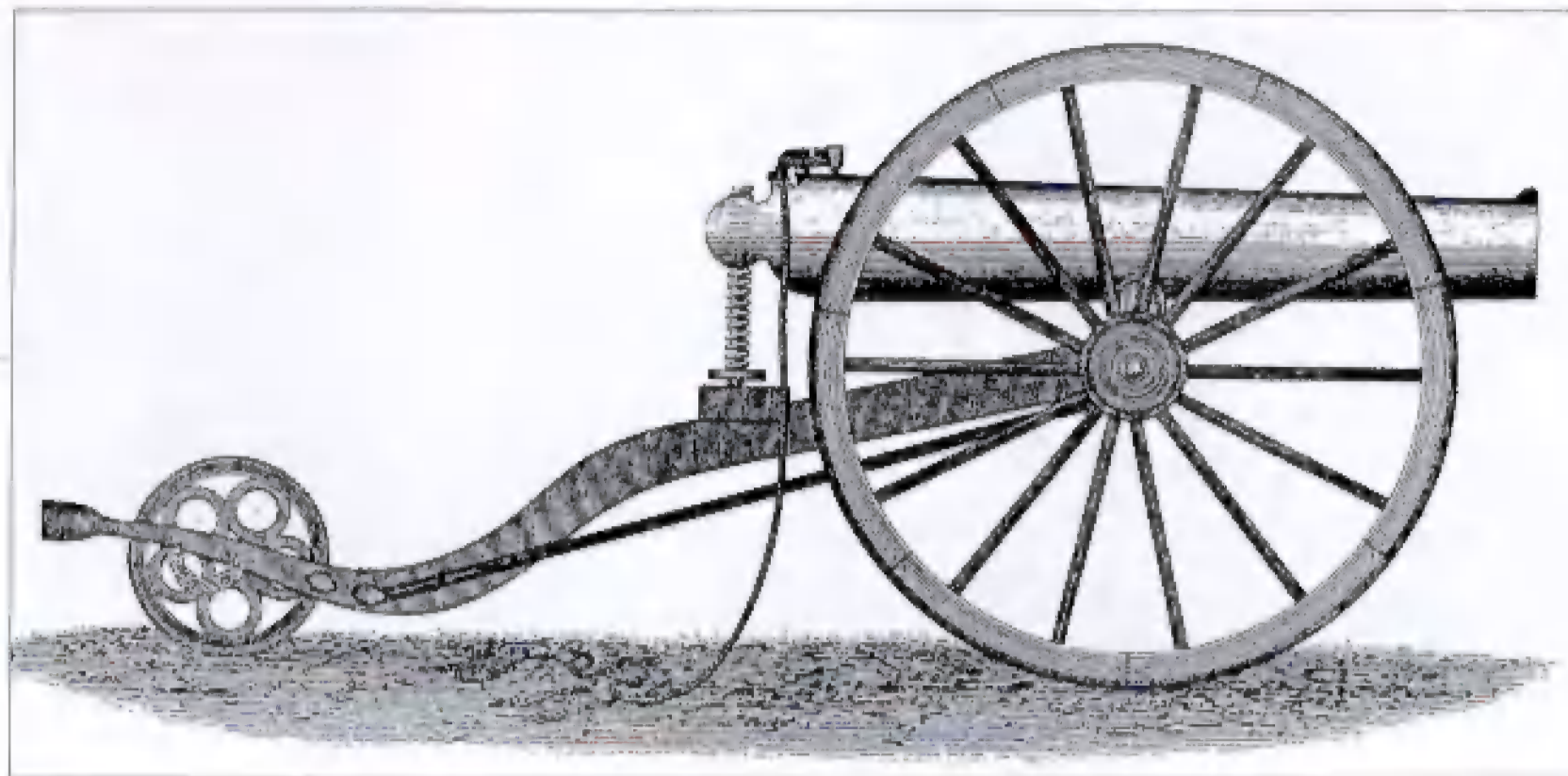


boat was making for land. Once the boat hit the shore, a crew of eight to ten men would mount it on its field carriage, an operation that took under four minutes. The weapon was then ready for use in ground-fire support. The carriage came with two ammunition boxes lashed to it, while each crew member also carried two rounds of ammunition in a leather pouch. The weapon was landed with a total of 72 rounds of ammunition which was considered more than enough for the typical landing.

The firing rate was eight times a minute – and up to ten times a minute in action – on the carriage, and five times a minute when mounted in the boat. All ammunition was fixed, and the crew had a choice of shell, shrapnel or spherical case, and canister. Powder charges were 1 lb. for the 12-pdr. and 0.625 lb. for the light 12-pounder. The 24-pdr. used a charge of 2 lb., which gave it a range of 1,270 yards for shell and 1,308 yards for shrapnel at five degrees elevation.

The navy acquired 456 medium 12-pdr., 177 light 12-pdr., 23 small 12-pdr., 424 rifled bronze 12-pdr., and seven steel 12-pdr. howitzers (which weighed 790 lb.) during the Civil War in addition to 100 rifled 20-pdrs. and 1,009 24-pdr. boat howitzers. They had all originally been made by the Washington Navy Yard, but demand forced contracts to go to the private companies Ames and Alger. Due to their unpopularity, the navy ceased acquisition of the small and light boat howitzers early in the war.

Although strictly made for U.S. Navy use, a number of these weapons ended up in army batteries on both sides. At Antietam, for example, they formed part of the ordnance of both Battery K, 9th New York Light Artillery, and Grime's Virginia Battery of the Army of Northern Virginia. They were so popular with the men of Grime's Battery, which was formed in the naval town of Portsmouth, Virginia, that when they were forced to give up one weapon in the overall reorganization, they surrendered a 3-in. Ordnance Rifle rather than the boat howitzer.



The U.S. Navy Dahlgren boat howitzer mounted on its all-metal field carriage. (Bureau of Ordnance, Ordnance Instructions, 1866)

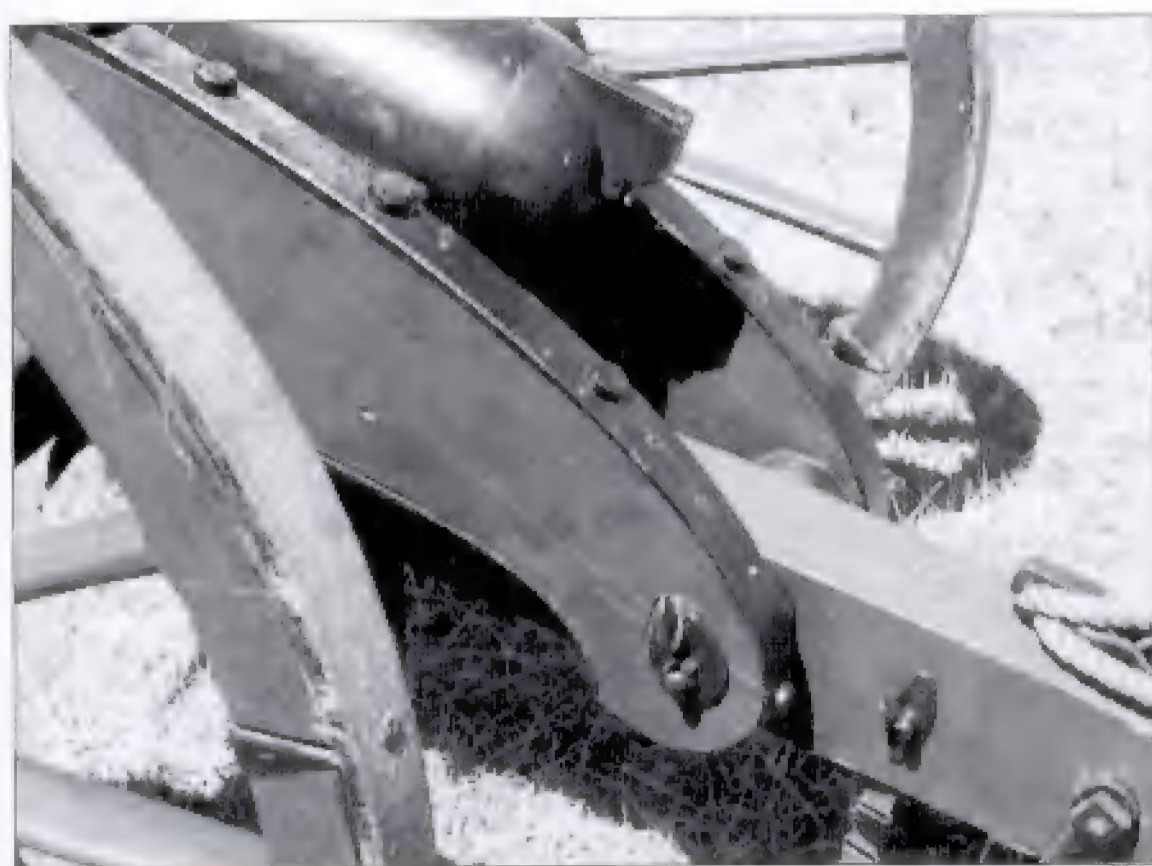
WIARD FIELD ARTILLERY

During the war, Norman Wiard, a Canadian by birth, held the job of Superintendent of Ordnance Stores for the U.S. Army. A talented inventor (he also designed and produced special river landing boats for the U.S. government), by 1863 he had developed an entirely new system of field artillery. Wiard's guns used semi-steel, a low carbon cast iron in which some scrap steel was mixed with the pig iron of the charge. The result was a tensile strength of 110,000 lb. per square inch, allowing for smaller barrels that could absorb greater charges. Wiard produced a



A 6-pdr. Wiard rifle. The novel gun with its special carriage is seen from both sides. (Library of Congress)

A detail of the unique carriage used on the Wiard rifle. Carriages could be nestled into each other on railroad flatcars, making it possible to transport more of these weapons on each car than a standard cannon on its carriage. (George Lomas Collection)



6-pdr. muzzle-loading rifled gun and a 12-pdr. howitzer that, complete with the unique carriage he also designed, weighed only 1,850 pounds. Beyond that, however, a charge of only 1 oz. of cannon powder would, at an elevation of 35 degrees, throw a 6-lb. shot 800 yards down range. A 2 oz. charge had a range of 1,200 yards, while with a full charge, a shot would travel four miles.

Wiard's carriages were also quite different from the standard carriage design. To withstand the strain of firing at excep-

tionally high elevations, the carriage stock was fastened to the underside of the axle. A flat surface plate was placed at the bottom of the trail to limit recoil and indeed, Wiard guns averaged only a 20-in. recoil, about half that of standard cannon. The carriages were smaller and could be nested together, taking only two-thirds the space of a standard field carriage on a ship deck or railroad car.

The carriage wheels were novel in that replaceable parts allowed easy repair. A system of bolts and wedges allowed for repairing the normal shrinkage of a wooden wheel and expansion of a tire, as well as quick repair of combat damage. In one test, Wiard showed that one man could repair the wheels more quickly than another man with an ax could actually damage them. The wheels had "shoes" that could be placed in front or behind a wheel to allow easy descent down steep slopes.

All the Wiard guns were cast at the Trenton, New Jersey, foundry which he owned, the first arriving at a Federal arsenal in December, 1861. The tubes were all marked on the right trunnions "N.W., N.Y.C., O.F."

It would be satisfying to report that such technologically superior weapons rapidly became the U.S. Army standard. They did not. In all, Wiard sold only 11 batteries, each with four 6-pdr. rifles and two smooth-bore 12-pdr. howitzers. This was despite the fact that field commanders found the weapons to be highly successful. For example, one Federal commander involved in the action around Charleston, South Carolina, reported in August, 1863 that: "Two Wiard field guns now in position there have proven very destructive to platforms and embrasures; more so than any field guns which have come under my observation." The 12th Ohio Battery brought their Wiard guns into action at



A view of a 6-pdr. Wiard rifle, showing the wheels and sight that were unique to it. (George Lomas Collection)

McDowell, Cross Keys, Freeman's Ford, White Sulphur, and the Second Bull Run. At Cross Keys one of the Wiard guns had the wood of the axle torn off, exposing the iron skeleton, but the cannon was fired another 200 times without damage to carriage or axle.

Some of these weapons were captured by Confederates and were issued to their batteries. Two, for example, were sent to the Army of Tennessee in early 1863, but their new owners soon got rid of them in favor of the more common guns.

THE WHITWORTH GUN

The Whitworth breechloading 12-pdr., a British-made gun, was especially designed for long-range use. Tests in England showed that it had a range of 2,600 yards at 5 degrees elevation; at 10 degrees, 4,500 yards; at 20 degrees, 7,000; and at 35 degrees, an astonishing 10,000 yards.

The Whitworth is most associated with the Confederacy, for most of these guns went south. A battery of six 2.75-in. Whitworths, complete with carriages, ammunition, and machinery for making more projectiles was donated to the U.S. government in 1861 by a group of American expatriates. Although these weapons did see limited service on the Peninsula, they were soon installed in the fixed defenses of Washington, never to be fired in anger. Southern forces received the rest of the Whitworths sent to America, and they did use these weapons. The downside, of course, for wide use, was their cost. A single 70-pdr. Whitworth cost £700. This compares to the cost of \$515.34, or about £103 at the 1860s exchange rate, for a U.S. Army contract 12-pdr. Napoleon muzzleloader.

The Whitworth also required special ammunition. Two Whitworths shipped to South Australia in 1867 were accompanied by a variety of ordnance: "The projectiles adapted to it consist of solid shot, common and shrapnell [*sic*] shell, rifled spheres and case shot. All the projectiles are made of hard metal and with the exception of the case-shot are rifled by machinery and fit the grooving of the gun." As supplies brought

through the blockade did not always reach their destination, the Richmond Arsenal went to work to replicate Whitworth's ammunition. In May, 1863, one of its officials reported that: "The Whitworth shells, fabricated at Richmond, are a decided success; they did admirable execution."

Even with this, the Confederate users found the range and accuracy to be astonishing. Capt. Hardaway opened fire with his battery's 12-pdr. Whitworth on enemy ships at a range of three miles with notable accuracy in December, 1862. At Fredericksburg, as Federals massed for their assault in December, 1862, a Union officer later reported that: "About noon on Sunday they planted a Whitworth gun in the bend of the Massaponax, which annoyed us considerably, throwing its bolts over the whole of the plain. It was so well posted as to be entirely screened from our batteries across the river, and at such a distance, and so hid by trees, as to be hardly discernible by the naked eye. After considerable difficulty, we succeeded in getting the range, which was found to be 2,700 yards with Hall's three guns, and soon silenced it. It did not reopen from that point."

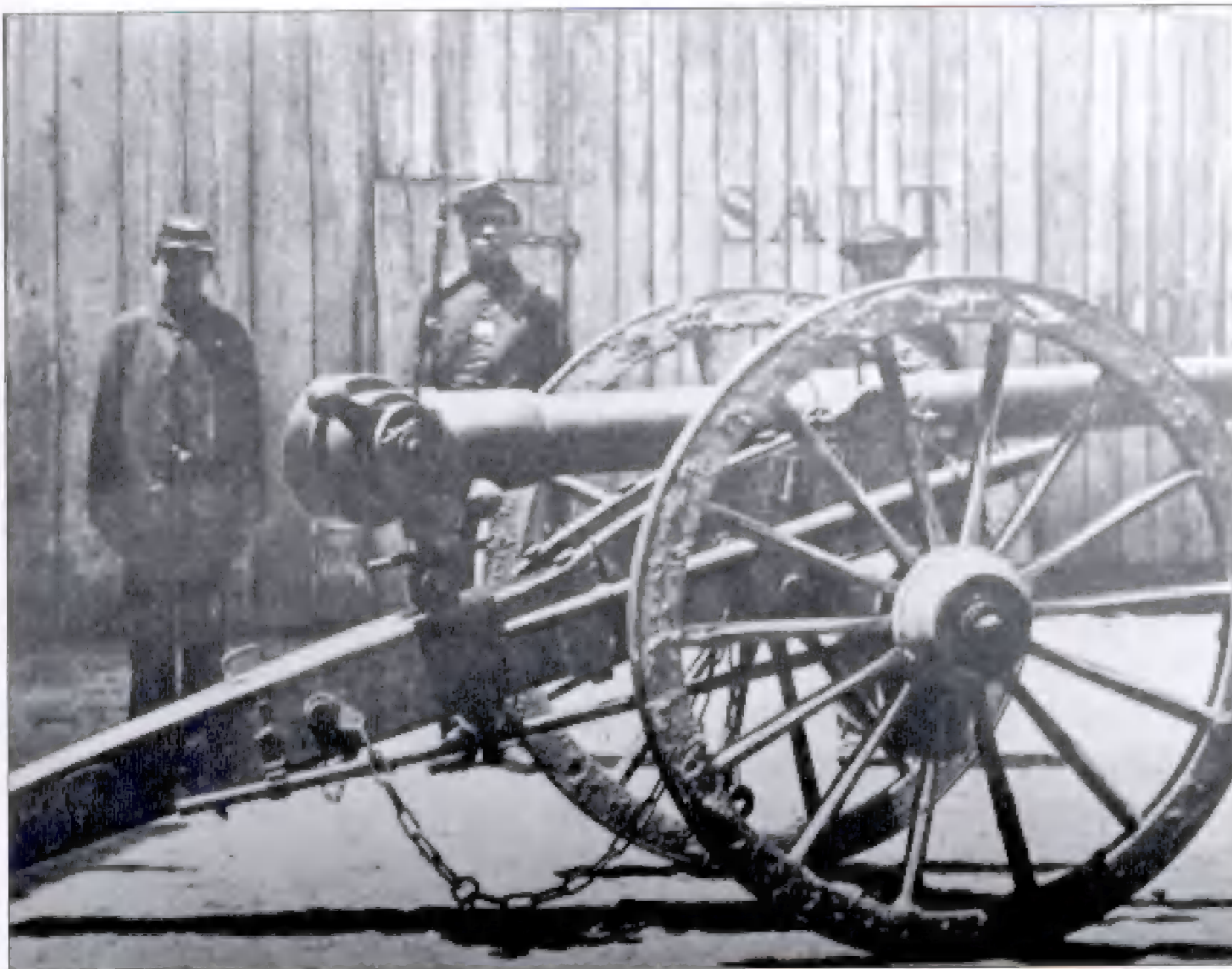
The trick was finding a proper spot for such a long-ranged, accurate weapon. None could be found, for example, in the heavily wooded Chancellorsville campaign until late in the action, when, as a Confederate artillery officer reported:

"The enemy's stragglers were discovered making into the road at a point about 1.5 miles from the river, where the head of a hollow curved around toward Falmouth and kept them out of view until they reached this main ridge. The Whitworth gun of Hardaway's [Hurt's] battery was trained on this point with happy effect. The road was soon cleared of stragglers when an enormous wagon park was discovered about 3 miles distant, where we were told the roads to Aquia Creek and United States Ford branched. Wagons were evidently being concentrated here from

United States Ford and Falmouth, while fires of infantry stragglers could be seen occupying every copse around the wagon camp. The range was speedily obtained with Whitworth shell, which operated beautifully, and the utmost consternation seemed to seize upon the teamsters and camp followers. Wagons were seen hurrying off in every direction from the park, while we plied them with solid bolts as long as we thought it would pay. The ammunition being very expensive, we soon desisted."

The Whitworth's main problem for the Confed-

A captured Whitworth rifle, imported by the Confederates from England. These guns were essentially too accurate at too long a range to be wholly effective, given the target acquisition and spotting methods of the period. (Library of Congress)



erates, besides the cost of its ammunition and difficulty of finding a proper place to site it, was the delicacy of its breechloading system in an age when soldiers were not used to mechanical objects. E. P. Alexander, the Chief of Artillery, First Corps, Army of Northern Virginia, recalled that: "The muzzle-loading 6-pdr. and six breech-loading 12-pdr. Whitworths were distributed through the army and often rendered valuable service by their range and accuracy. They fired solid shot almost exclusively, but they were perfectly reliable and their projectiles never failed to fly in the most beautiful trajectory imaginable. Their breech-loading arrangements, however, often worked with difficulty and every one of the six was at some time disabled by breaking of some of its parts, but all were repaired and kept in service. As a general field piece, the efficiency was impaired by its weight and the very cumbrous English carriage on which it was mounted." Indeed, the Whitworth in the Vicksburg garrison burst on the first day of the siege, its cartridge apparently loaded incorrectly.

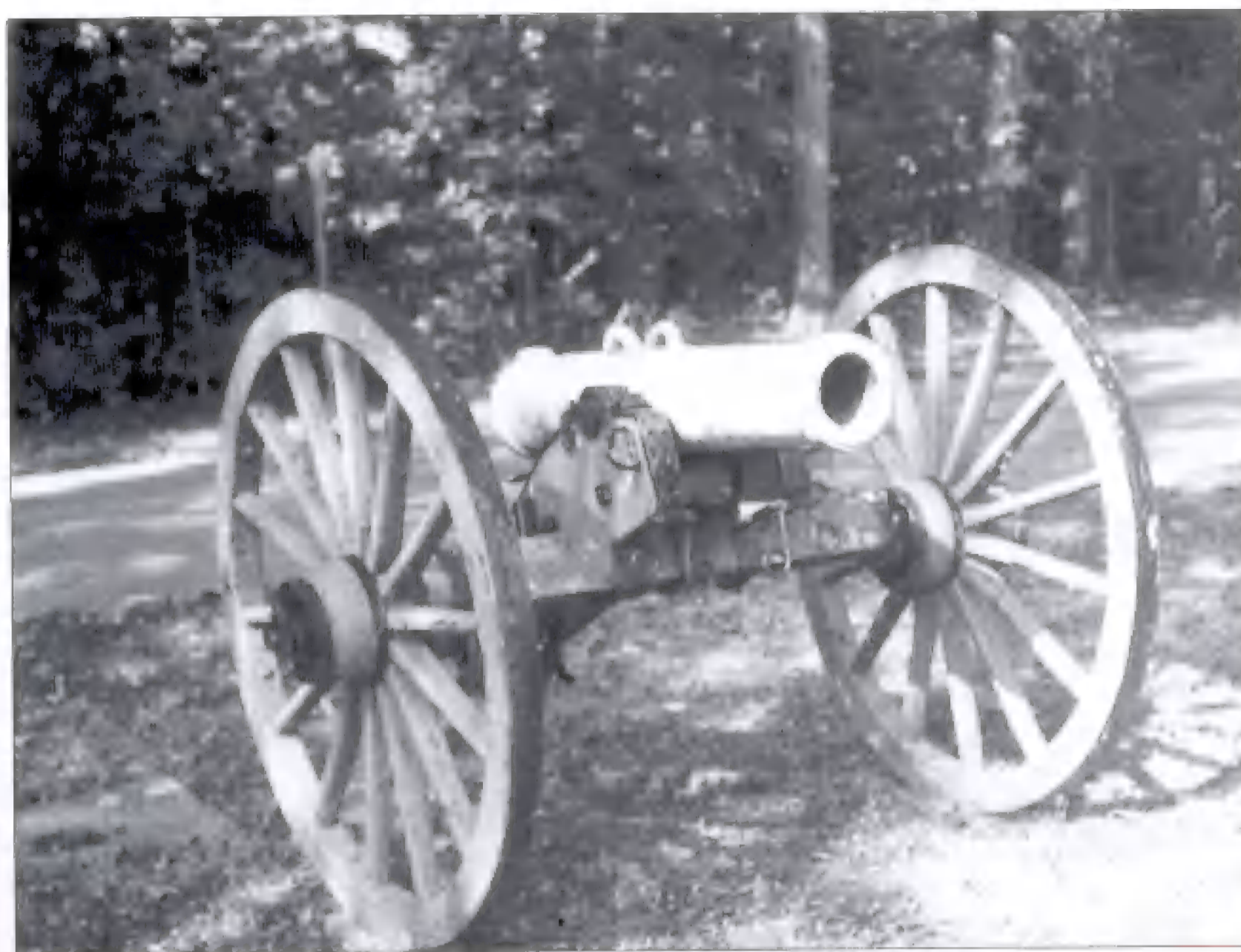
Confederate ordnance officers also found the Whitworth carriages not only "cumbrous," but also incapable of handling the stress of service. One of the Whitworths in Lee's army broke its axle on the first day, was repaired, and then the same axle broke again under the shock of firing. By 1864 the Richmond Arsenal was producing stronger but lighter carriages for Confederate Whitworths.

Austrian officer FitzGerald Ross summed up the Confederate Whitworth experience in July, 1863: "There are a few Whitworth guns, which are very accurate and of great range, but require much care. The breech has sometimes been blown off or disabled through carelessness in loading. This was especially the case with breech-loading guns. I understand that the Whitworth guns which are now sent out are muzzle-loading. Their field-ammunition the Confederates consider to be far superior to that of the Yankees. Spherical case (shell filled with musket-balls) is the most successful projectile they use."

CONCLUSION

The Civil War began with an emphasis on modernizing artillery; the introduction of the 12-pdr. Napoleon, followed closely by rifled cannon gave cannoneers greater hitting power at greater ranges. But once the war had begun, the emphasis shifted to producing weapons quickly and cheaply for the vast armies in the field. Little or no research or experimentation was carried out on developing breechloading weapons or on the indirect fire control such weapons would need to be effective. The result was that the 12-pdr. Napoleon would continue as the U.S. Army's primary field artillery weapon for many years after the war. It must be admitted, however, that the army's main opponent for decades after the Civil War was the Native American, and their forces were notably lacking in artillery. So the Napoleon was sufficient. In 1918, however, the U.S. found themselves dependent on the French for the bulk of their modern field artillery, with the adoption of the French 75 for the American field artillery.

Where there was development during the war, it was in organization; the armies centralized their artillery which had been



The Confederates imported 32 of these Austrian Army 12-pdr. rifled guns in 1862-63. (Gettysburg National Battlefield Park)

assigned by battery to individual brigades at the start of the war. Both armies organized artillery battalions from individual batteries, and gave their commanders higher ranks than field artillerymen had previously held. This allowed for guns to be massed under one director at important actions. Even this organizational development was not universal. For example, at Gettysburg, the Army of Northern Virginia, which had been able to mass guns well at the Second Manassas, was unable actually to get all of its cannon to fire on the

Union line to prepare for Pickett's Charge.

The Confederacy had another problem it was never fully able to overcome, and that was of the quality of southern-made cannon, fuses, and ammunition. The Union ordnance never faced this problem, instead pouring money into northern foundries that continued to build the nation long after the war was over.

GLOSSARY

Canister - a tin cylinder filled with iron balls attached to a sabot and powder bag used in anti-personnel firing.

Cap-square - the iron fittings over a tube's trunnions which secured the tube to the carriage.

Cascabel - the knob on the end of a gun tube.

Case shot - hollow cast-iron shot with musket balls in the center designed as an anti-personnel weapon.

Friction primer - a small tube filled with rifle powder inserted into the vent and fired by pulling a lanyard that drew a rough wire briskly through a friction composition to set off a spark and fire a cannon.

Fuze gouge - a small knife-like device with a wooden handle used to set the cover on the Bormann fuse.

Gunner's level - a brass device much like a spirit level, designed to sit on top of a gun tube with a brass tube holding water with a bubble in it that indicates the angle at which the tube is sitting compared to the center of gravity.

Handspike - a wooden pole that was fitted into the pointing rings at the base of a trail and used to move the piece from side to side as the gunner directed.

Lanyard - a rope with a hook at one end and a wooden handle at the other used to fire a friction primer.

Limber chest - the ammunition chest, its name derived from the fact that it was usually carried on a limber, although it was also carried on a caisson.

Lunette - the iron circle at the rear of a gun's trail that fits into the hook on a limber so it can be pulled.

Pendulum sight (also **pendulum hausse**) - a brass device with an elevating sight that can be moved up and down. The sight is fixed to a holder on the rear of the cannon muzzle, a weight at the bottom keeping it perpendicular to the ground, to sight the cannon. It was carried in a leather pouch worn by the gunner.

Pointing rings - a pair of parallel iron rings on a trail.

Prolonge - a rope usually carried twisted on the trail of the cannon with a hook at one end to fit into the lunette at the rear of a gun's trail, and an iron handle at the other with loops along its length that was used by the cannoneers to pull a gun off a firing line when hooking it to a limber was impossible.

Sabot - a block of wood or metal at the end of a round.

Shell - hollow shot filled with black powder designed to explode and throw fragments into enemy formations.

Solid shot - spherical solid ammunition.

Thumbstall - a piece of padded leather worn on a cannoneer's left thumb to cover the vent during cleaning and loading to prevent air entering the bore and igniting any sparks or powder.

Trunnions - the circular protrusions at the center of balance of a piece that fit onto the carriage to hold a tube on the carriage.

Vent pick - an iron pick, twisted into a circle at one end and sharpened at the other used to pierce the powder bag before the friction primer was inserted to fire the piece.

Worm - an iron corkscrew fitted to the end of a long pole and used to search the bore of a piece after firing to secure all pieces of smoldering powder bags and prevent premature explosions.

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THE PLATES

A: The caisson and limber attached - a side view.

Each gun had its own limber, plus a spare limber and caisson. The caisson was used to carry two extra limber chests, filled with ammunition. All the extra ammunition, as well as a spare wheel were stored in the limber chests that sat on top of the caisson. Each limber chest was removable, but when filled with ammunition, they were too heavy to be easily moved. Although a gun crew normally walked alongside the gun when it was being moved, they could also ride a caisson and limber. In this case, seated from left as they faced front, the gunner, number six, and number five rode the limber used to pull the gun, while number two, number seven, and number one rode the limber that pulled the caisson. Number four, number eight, and number three rode on the front limber chest of the caisson.

Numbered parts are: 1: stock; 2: side rail; 3: foot board; 4: ammunition chest; 5: spare wheel; 6: axle for spare wheel; 7: chain and toggle; 8: lock chain; 9: spare pole.

B: The 12-pdr. Napoleon gun attached to the limber, a side view.

Generally ammunition enough for a single action could be carried in the limber chest mounted on top of the limber which was also used to haul the gun. Indeed, the limber was essentially the artilleryman's prime mover, as it had the pole for attaching horses, while the hook on the back could be used to haul a gun, a caisson, a battery wagon, or a traveling forge. Rammers and screws used to clean out the gun, were fitted in iron hooks under the gun carriage, while a water bucket, needed to swab out the gun during use hung from the

A limber and caisson stand ready to be hitched up. (Gettysburg National Battlefield Park)

bottom of the carriage and a grease bucket, in which spare grease was carried, hung from the bottom of the limber.

The parts numbered are: 1: handles; 2: ammunition chest; 3: turnbuckle and hasp; 4: corner plates; 5: prolonge; 6: stay pins and keys; 7: pintle hook; 8: axle body; 9: axle tree; 10: pole prop; 11: end bands of splinter bar, trace hooks and pole prop chain; 12: foot boards; 13: pole strap; 14: pole pad; 15: pole yoke; 16: pole.

C: The 12-pdr. Napoleon gun attached to the limber, a top view.

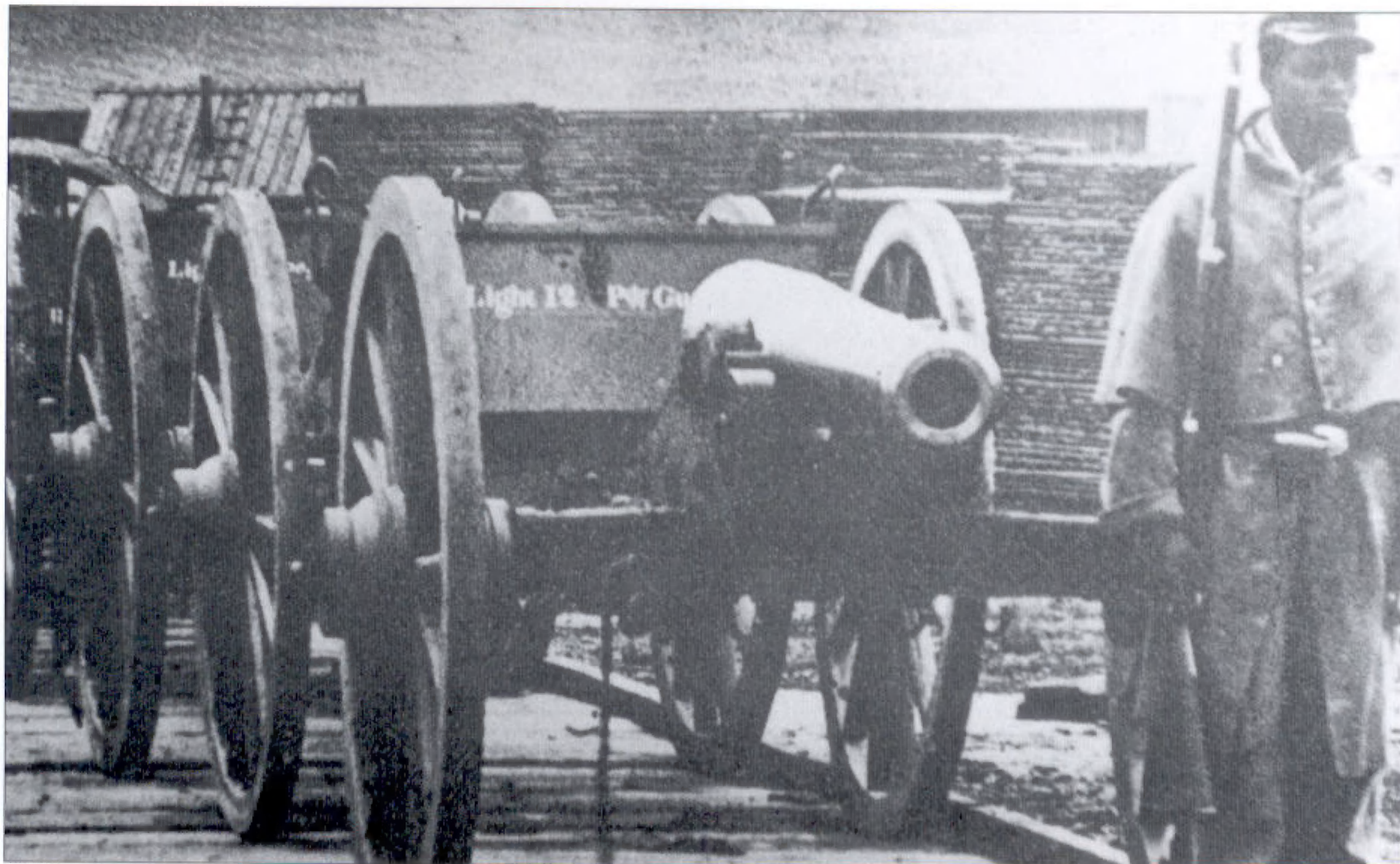
Equipment used with each gun was carried with the gun into action. The prolonge rope, by which the men could pull the gun on the field without having to resort to a horse team, was tied up on top of the carriage trail.

The parts numbered are: 1: prolonge hooks; 2: axle body; 3: nave bands; 4: handspikes and sponges; 5: cap square; 6: head of chin bolts; 7: wheel guard plates; 8: small pointing ring; 9: trail handles; 10: foot boards; 11: pole; 12: splinter bar; 13: lunette; 14: trail plate; 15: large pointing ring.

D: A detailed schematic drawing of the pattern for the 6-pdr. field gun carriage and the tubes it mounted.

The standard U.S. light artillery carriage at the start of the 19th Century used a split or flask trail design, although from as early as 1778 the British had been using a single trail design that offered advantages in terms of ease of construction and a shorter turning radius, with greater mobility.

The French Army adopted the British system in 1827, and the Americans began producing copies of the French



ABOVE 12-pdr. Napoleons near City Point, Virginia, in 1864. Note the markings on the front of the limber chest. (Library of Congress)

BELOW A battery wagon belonging to the 3rd Battery, Excelsior Brigade, from New York, at the battery's ordnance park in Washington. (U.S. Army Military History Institute)



carriages in 1830, based on drawings obtained by a visiting U.S. officer in 1829. They were so successful that they were adopted for the entire service in 1836. The carriage was officially designated the pattern of 1840.

American carriages came in three sizes, the most popular one of which was the 6-pounder gun carriage that was used for Napoleons, Parrott Rifles, 3-in. Ordnance Rifles and some Blakely and Wiard rifles. The 24-pounder howitzer carriage was similar but larger, although it was also sometimes used for Napoleons.

E: A battery wagon. Top and side views with a cutaway of the interior from the top.

Equipment used for the battery was carried in the battery wagon, along with spare hay for the horses in the forage rack on its back. Equipment would have included: sabers, which were issued to all artillerymen but not worn in action by any but drivers; thumbstalls, used to prevent air from entering the bore while the weapon was being cleaned and reloaded between shots; vent picks, used to pierce the fabric powder bag so that a spark from the friction primer can enter it to explode the powder; vent cleaning punches, used to clear out the vent between shots; a pendulum hausse used by the gunner to aim the cannon by making sure it is level; the lanyard and friction primers.

Numbered parts (side view) are: 1: lunette; 2: stock; 3: guard plate; 4: lock chain bridle; 5: lock chain; 6: cover strap and turnbuckle; 7: lock chain hook; 8: bottom rails; 9: side boards; 10: bars of forage rack; 11: forage rack chains; 12: cover boards.

Numbered parts (top view) are: 1: lunette; 2: stock; 3: spare stock stirrup; 4: hinges; 5: cover boards; 6: bows; 7: cross bars; 8: bottom boards; 9: spare stock hook;

10: sides of forage rack; 11: bars of forage rack; 12: bottom rails.

F: The traveling forge, top and side cutaway views.

Each battery had a traveling forge which was pulled by a limber, and used to reshoe horses and occasionally replace small pieces of iron cannon or limber parts damaged in action. The horseshoes, nails, and anvil were stored in the limber chest, while coal was carried in the chest on the rear of the forge. A vice was attached to the pole that connected the forge to its limber. Within minutes of stopping the forge could be in action, with a farrier assigned to work it.

Numbered parts (side view) are: 1: vice; 2: fireplace; 3: air back; 4: back of fireplace; 5: windpipe; 6: fulcrum and support for bellows pole; 7: bellows; 8: roof of the bellows house; 9: handles; 10: turnbuckle and hasp; 11: coal box; 12: side rail; 13: bellows hook; 14: stock stirrups; 15: stock; 16: prop.

Numbered parts (top view) are: 1: lunette; 2: wheel guard plates; 3: fireplace; 4: air back; 5: bellows hook; 6: fulcrum; 7: hook and staples for carrying bellows pole; 8: roof boards;

9: handles of coal box; 10: hinges of coal box; 11: lid of coal box; 12: bottom boards; 13: bellows; 14: bows; 15: hinges; 16: windpipe; 17: stock.

G: Packed limber boxes.

Both from top and side, showing packed ammunition for, 1: 6-pdr. Gun; 2: 12-pdr. Gun; and 3: 12-pdr. howitzer. In the chests for the 6-pdr. and 12-pdr. gun (the Napoleon) a small tray was fitted so that the ammunition would be snug in the limber chest. It could be used for friction primers, tools, or whatever the section chief or battery commander wanted. The ammunition itself sat on wooden sabots, the ball resting in the sabot. The rounds were attached to cloth, usually flannel, sacks in which the powder was carried. They would be rammed into the tube as a single piece. The larger types of ammunition, one slot of which appears for each gun, were fixed canister rounds, iron balls packed into what was essentially a tin can, that were used for anti-personnel rounds at close ranges.

The battery farrier makes use of the battery forge for some quick horse-shoeing in this etching by eyewitness Edwin Forbes.



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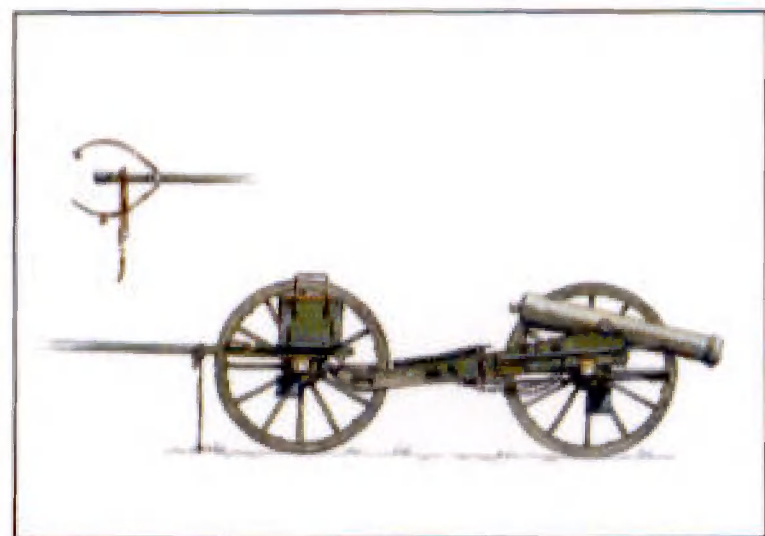
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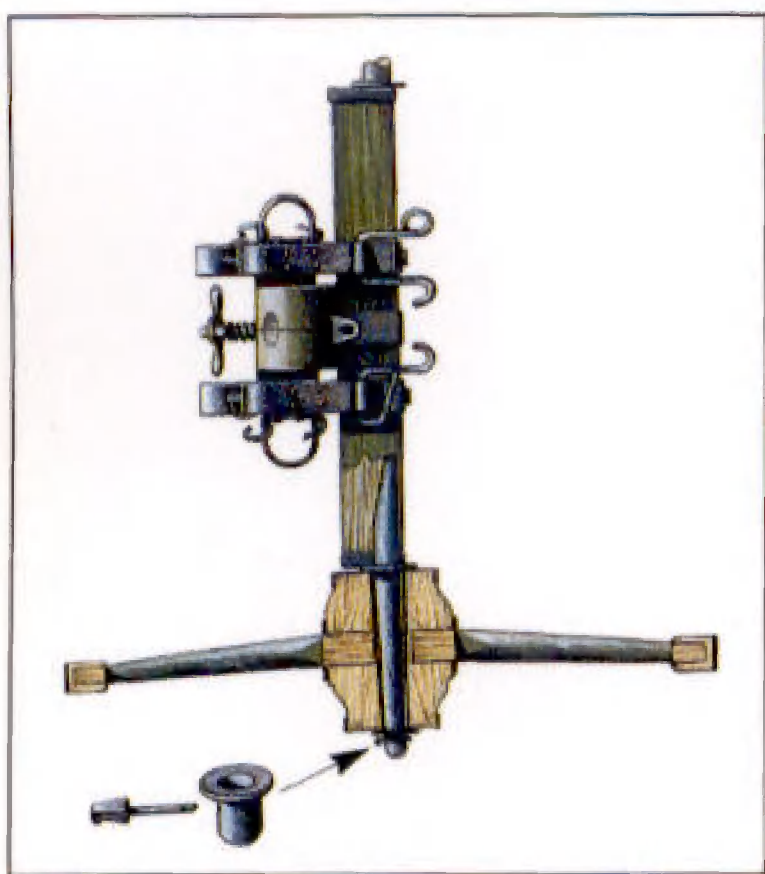
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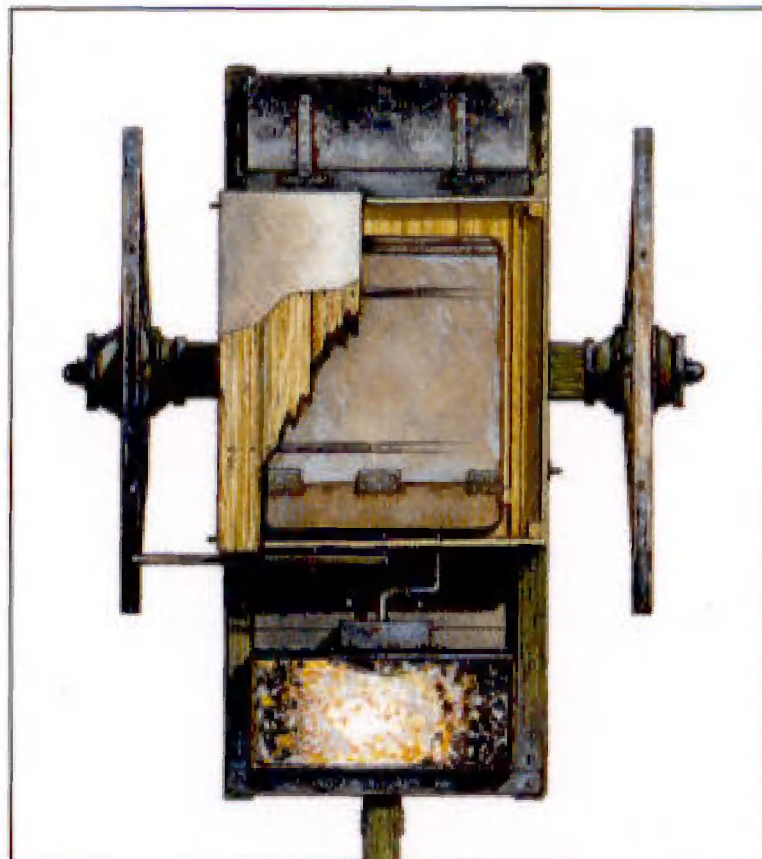
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